# ADX DAS User Manual

## Version 0.3

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## Revision History

| Version | Author | Descriptions | Date |
|---|---|---|---|
| 0.1 | BC Kim | Initial Release | |
| 0.2 | Sun Kim | Edited version of the initial release | 2/28/12 |
| 0.3 | YHKO | HE, RU PSU Back panel Fig. revised, HE Back side Fig. revised | 3/8/12 |
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## Change List

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# Terms and Abbreviations

The following is a list of abbreviations and terms used throughout this document.

| Abbreviation/Term | Definition |
|---|---|
| **AGC** | Automatic Gain Control |
| **ALC** | Automatic Level Control |
| **AROMS** | ADRF' Repeater Operation and Management System |
| **BCU** | Band Combiner Unit |
| **BTS** | Base Transceiver Station |
| **CDMA** | Code Division Multiple Access |
| **CHC** | Channel combiner |
| **CW** | Continuous Wave (un-modulated signal) |
| **DAS** | Distributed Antenna System |
| **DL** | Downlink |
| **Downlink** | The path covered from the Base Transceiver Station (BTS) to the subscribers' service area via the repeater |
| **HE** | Head End |
| **HPA** | High Power Amplifier |
| **HW** | Hardware |
| **IF** | Intermediate Frequency |
| **LNA** | Low Noise Amplifier |
| **LTE** | Long Term Evolution |
| **MS** | Mobile Station |
| **NMS** | Network Management System |
| **ODU** | Optic Donor Unit which is located in OPT. A OPT has two ODUs. |
| **OEU** | Optic Expansion Unit |
| **OPT** | Optic Unit |
| **PLL** | Phased Locked Loop |
| **PSU** | Power Supply Unit |
| **RF** | Radio Frequency |
| **RFU** | RF Channel Unit |
| **RU** | Remote Unit which is composed of master RU and multiple slaves RU |
| **SQE** | Signal Quality Estimate |
| **Sub RU** | generic term for master RU and slave RU |
| **SW** | Software |
| **UL** | Uplink |
| **Uplink** | The path covered from the subscribers' service area to the Base Transceiver Station (BTS) via the repeater |
| **VSWR** | Voltage Standing Wave Ratio |

## 1. IN TRODUCTION

**Up to (8) frequency bands in one body**: Currently the ADX supports 700 MHz (Lower A, Lower B, Upper C), Cellular, PCS, and AWS bands.

### 1.1 Highlights

- Modular Structure
  - Supports multi bands service (700MHz, Cell, PCS, AWS, etc.) in one body
  - Can support up to 8 RF units
- Supports optional combining/balancing of multiple carriers' signals via BCU (Band Combiner Unit)
- MIMO capable
- Supports up to a of maximum of 32 Remote Units
- 30dBm of downlink composite output power
- Operates with up to 5dBo optical loss (Single mode)
- Supports SNMP v1, v2, v3 (get, set & traps)
- Web-based GUI Interface; No 3rd party GUI software required
- Web-GUI connectivity via DHCP in host mode
- Versatility and Usability: ADX gives total control to the user. Control parameters such as gain, output power, and alarm threshold can be changed using Web-GUI interface allowing the user to fine tune the system to the given RF environment.
- Automatic uplink noise measurement routine
- Automated installation
- Support RU View mode, refer to section 3.1.1.4
- Incremental Automatic Shutdown/Resume Time: ADX gradually increases the time span between automatic shutdown and resume period before it permanently shuts itself down
- Support ALC function to prevent ADX DAS from input overload or output overpower

## 1.2 Parts List

### 1.2.1 HE Part Lists

**Table 1-1 HE Parts List**

| Label | Quantity | Description |
|---|---|---|
| **ADX-H-NMS (Required)** | | |
| A | 1 | ADX-H-NMS (NMS module) |
| B | 1 | HE Chassis |
| R | 1 | Extension bracket for added modules, wall mount |
| C | 1 | AC Power Cable |
| D | 1 | Ethernet Cable (Crossover) |
| E | 1 | Ground Cable |
| F | 8 | Anchor Bolt |
| G | 1 | Documentation CD(User Manual, Quick Start Guide and Troubleshooting Guide) |
| **ADX-H-RFUs (At least 1 required)** | | |
| H | Up to 8 | ADX-H-RFU, At least 1 module must be present in order to use ADX DAS |
| I | 2/RFU | RF Cables between CHC and RFU, SMA Male to SMA Male |
| M | 1/RFU | Module Data Cable, needed for RFUs connected to AUX CH1 or 2 ports |
| **ADX-H-CHC (Required)** | | |
| J | 1 | ADX-H-CHC (HE Channel Combiner) |
| **ADX-H-PSU (Required)** | | |
| J | 1 | ADX-H-PSU (HE Power Supply Unit) |
| C | 1 | AC Cable |
| **ADX-H-OPT or ADX-H-ODU (At least 1 required)** | | |
| K | 1 | ADX-H-OPT or ADX-H-ODU |
| L | 2 or 4 | RF Cables between CHC and OPT, SMA Male to SMA Male<br>4 for ADX-H-OPT/ 2 for ADX-H-ODU |
| M | 1 | Module Data Cable |
| S | 1 | Extension bracket for wall mount |
| **ADX-H-BCU (Optional)** | | |
| N | 1 | Optional Band Combiner |
| O | 2 | RF Cables between BCU and RFU, N Male to N Male |
| M | 1 | Module Data Cable |
| S | 1 | 1U Extension bracket for wall mount |
| **ADX-H-OEU (Optional)** | | |
| P | 1 | ADX-H-OEU (Optic Expansion Unit) |
| Q | 1 | AC/DC Adaptor |
| C | 1 | AC Cable |

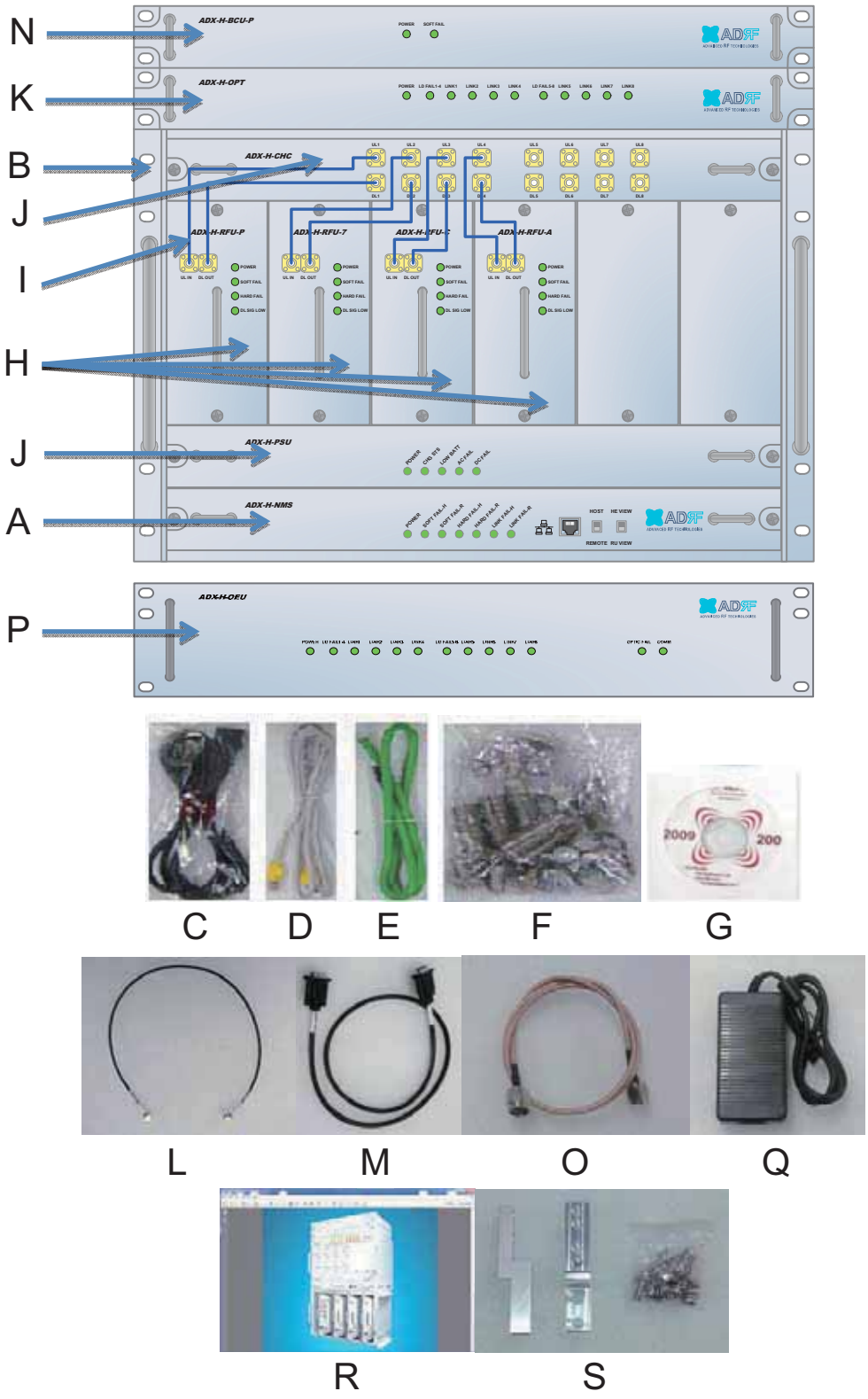



**Figure 1-1 HE Parts List**

### 1.2.2 R U Part Lists

**Table 1-2 RU Parts List**

| Label | Quantity | Description |
|---|---|---|
| **ADX-R-CHA-30 (Optional)** | | |
| A | 1 | ADX-R-CHA-30 (RU Chassis) – Supports (1) Master RU + (3) Slave RU |
| B | 1 | Extension bracket for added modules, wall mount |
| C | 1 | Anchor Bolt |
| D | 1 | Ground Cable |
| **Master RU (At least 1 required)** | | |
| E | 1 | ADX-R-x30M (Master RU) |
| H | 1 | USB Cable (Type A to Type B) |
| I | 1 | Documentation CD(User Manual, Quick Star Guide and Troubleshooting Guide) |
| J | 1 | Power Cable connected to RU PSU |
| K | 1 | PSU Alarm Cable connected to RU PSU |
| L | 1 | Wall Mount Bracket & Bolt |
| **Slave RU (Optional)** | | |
| M | Up to 7 | ADX-R-x30S (Slave RU) |
| N | 2 | RF cables between Mater RU and Slave RU |
| O | 1 | RS 485 Cable |
| J | 1 | Power Cable connected to RU PSU |
| L | 1 | Wall Mount Bracket & Bolt |
| **ADX-R-4WS (Optional)** | | |
| P | 1 | 4W splitter to support more than 4 Sub RUs |
| Q | 2 | RF cables between Mater RU and ADX-R-4WS |
| **ADX-R-PSU-30 (Required or can use ADX-R-ADP-30)** | | |
| R | 1 | ADX-R-PSU-30 (Power Supply Unit) |
| S | 1 | 1.5U Extension bracket for wall mount |
| **ADX-R-CHC-V (Optional)** | | |
| T | 1 | ADX-R-CHC-V (RU channel combiner for VZW) |
| S | 1 | 1.5U Extension bracket for wall mount |
| **ADX-R-ADP-30 (Required or can use ADX-R-PSU-30)** | | |
| F | 1 | AC/DC Adaptor |
| G | 1 | AC Cable |

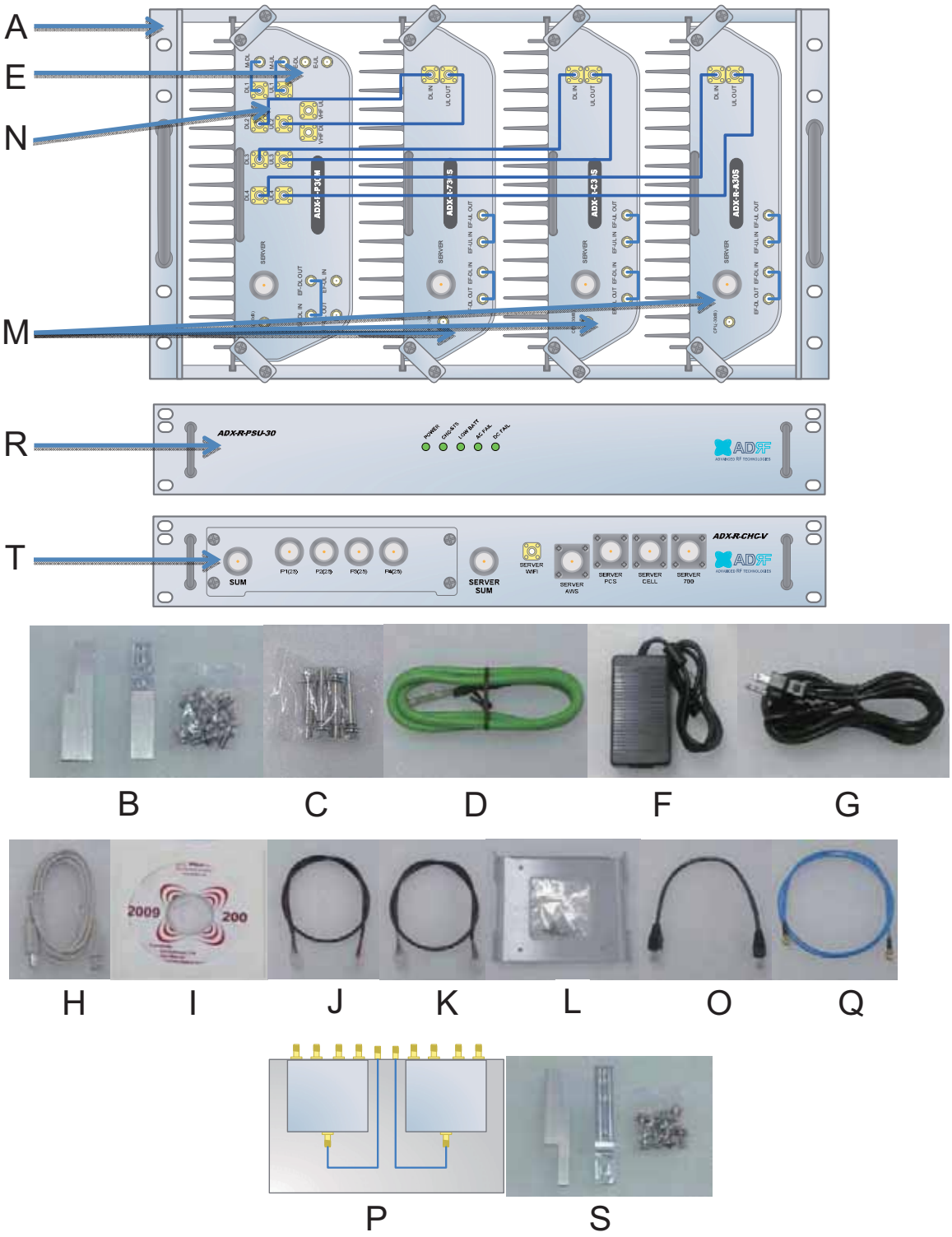



**Figure 1-2 RU Parts List**

## 1.3 ADX DAS Quick View

### 1.3.1 HE Quick View

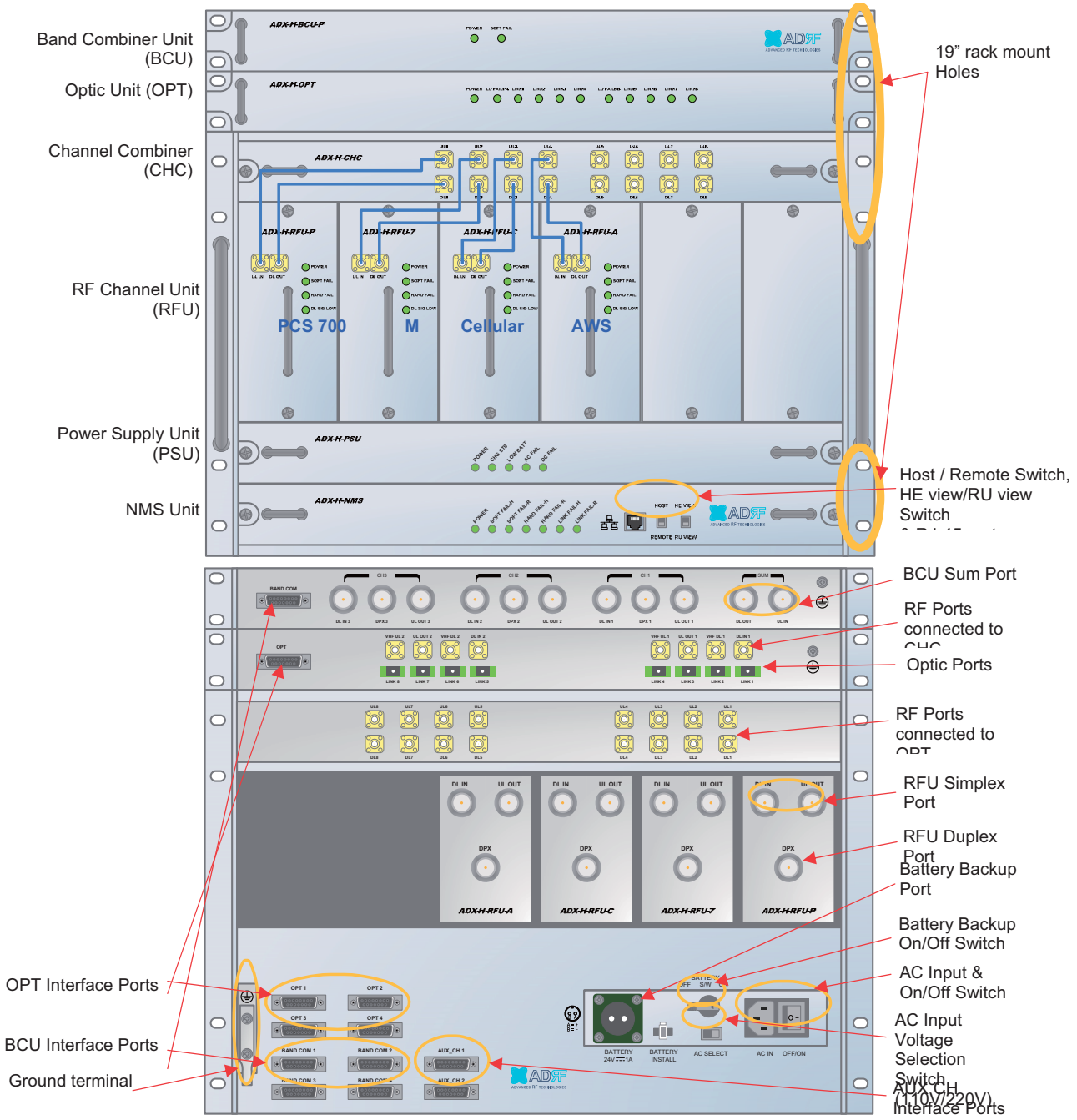



**Figure 1-3 ADX DAS HE Quick View**

### 1.3.2 RU Quick View

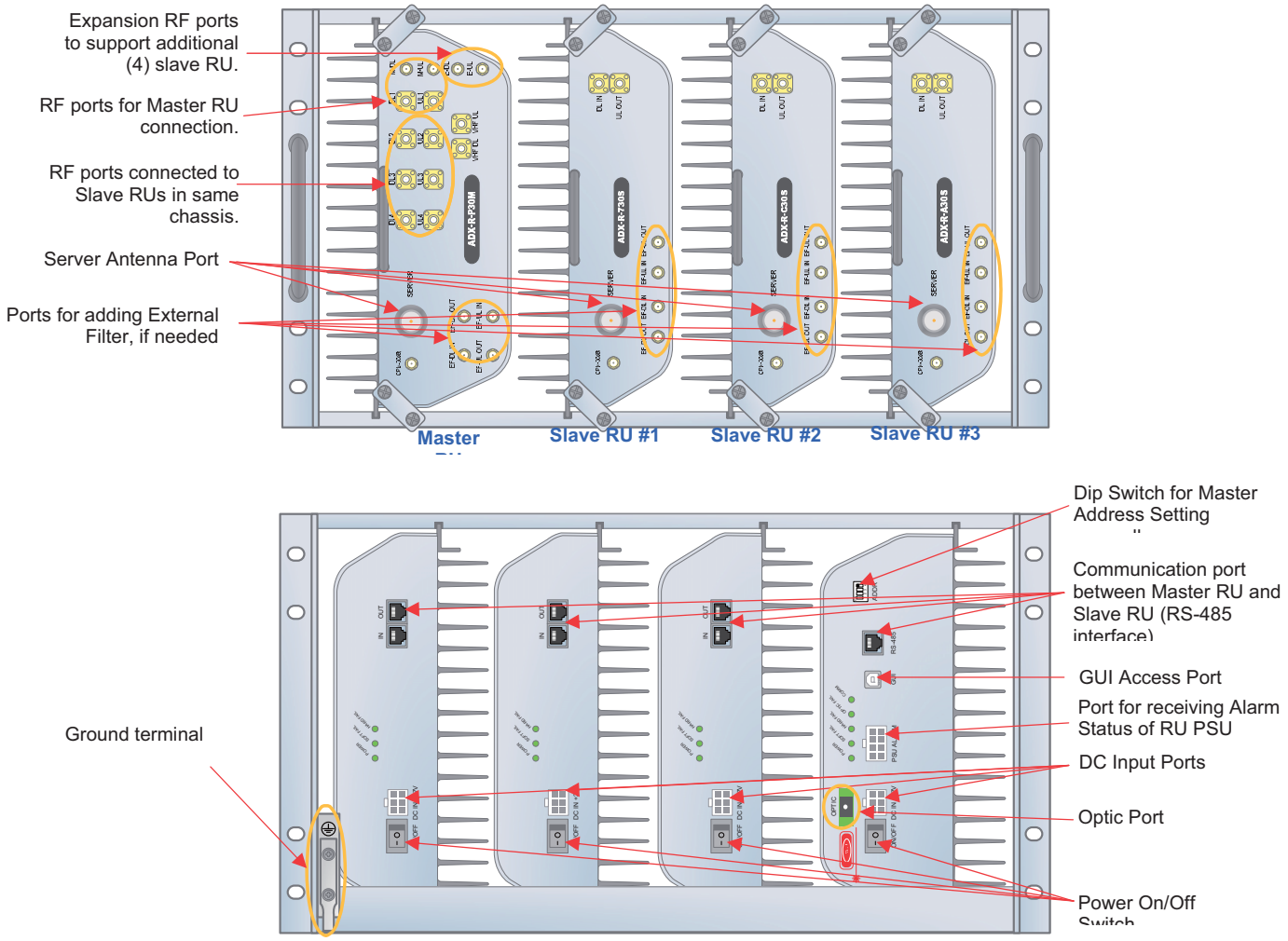



**Figure 1-4 ADX DAS RU Quick View**

### 1.4 Warnings and Hazards


## WARNING! ELECTRIC S OC

Opening the ADX DAS could result in electric shock and may cause severe injury.


## WARNING! EXPOSURE TO RF

Working with the ADX DAS while in operation, may expose the technician to RF electromagnetic fields that exceed FCC rules for human exposure. Visit the FCC website at www.fcc.gov/oet/rfsafety to learn more about the effects of exposure to RF electromagnetic fields.

## RF EXPOSURE & ANTENNA PLACEMENT Guidelines

Actual separation distance is determined upon gain of antenna used.

Please maintain a minimum safe distance of at least 20 cm while operating near the donor and the server antennas. Also, the donor antenna needs to be mounted outdoors on a permanent structure.

## WARRANTY

Opening or tampering the ADX DAS will void all warranties.

Lithium Battery: CAUTION. RISK OF EXPLOSION IF BATTERY IS REPLACED BY INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO INSTRUCTIONS.

Ethernet Instructions: This equipment is for indoor use only. All cabling should be limited to inside the building.

## FCC Part 15 Class A

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

## Laser Safety

Fiber optic ports of the ADX DAS emit invisible laser radiation at the 1310, 1550nm wavelength window.

To avoid eye injury never look directly into the optical ports, patch cords or optical cables. Do not stare into beam or view directly with optical instruments. Always assume optical output is on.

Only technicians familiar with fiber optic safety practices and procedures should perform optical fiber connections and disconnections of the ADX DAS and the associated cables.

The ADX DAS complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to laser notice No.50 (July26, 2001)@IEC 60825-1 Amendment2 (Jan. 2001)

## Care of Fiber Optic Connectors

Do not remove the protective covers on the fiber optic connectors until a connection is ready to be made. Do not leave connectors uncovered when not connected.

The tip of the fiber optic connectors should not come into contact with any object or dust.

Refer to the cleaning procedure for information on the cleaning of the fiber tip.

## 2. B LOCK DIAGRAM

### 2.1 ADX DAS Block Diagram

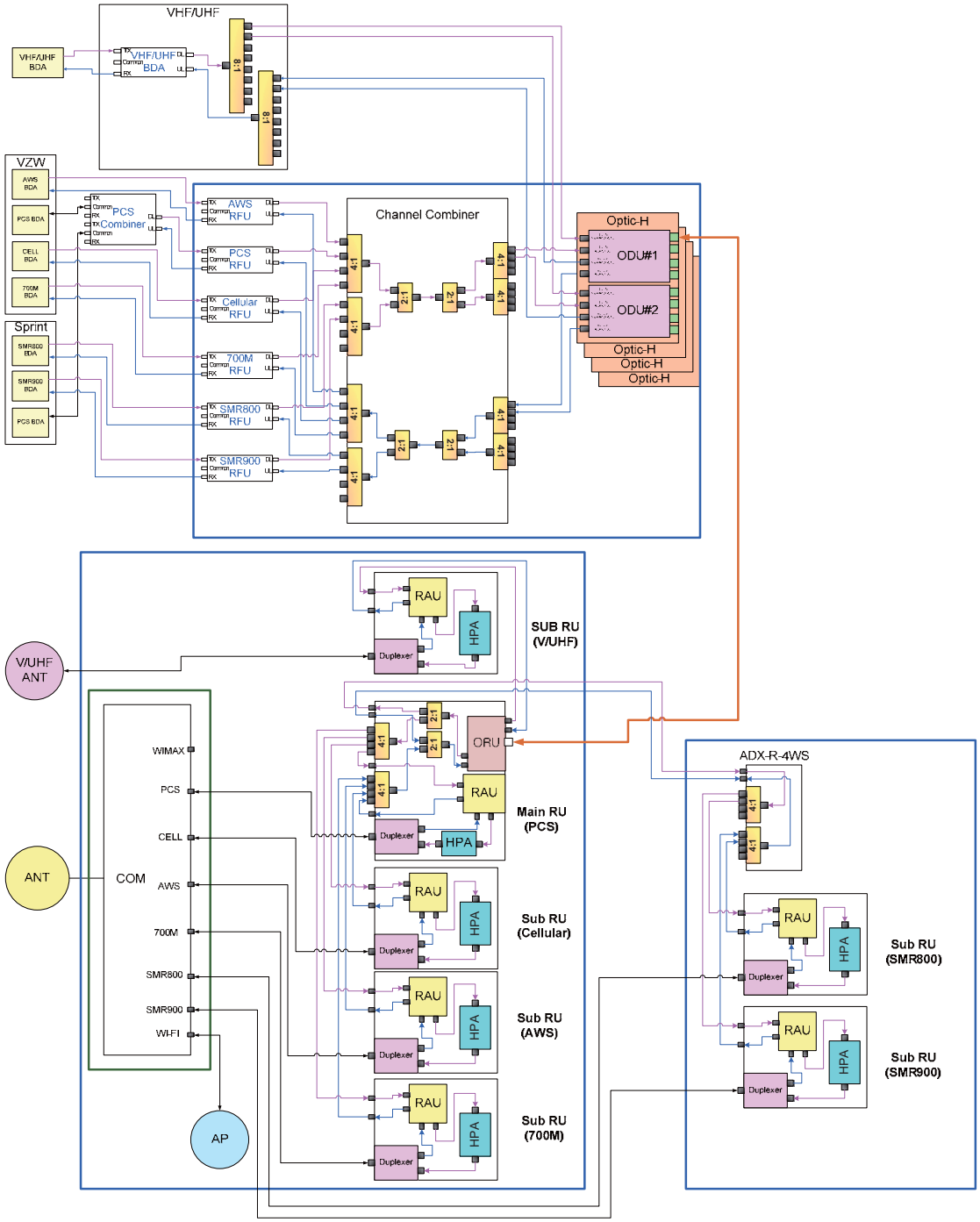



**Figure 2-1 ADX DAS Block Diagram**

## 2.2 ADX DAS Topology

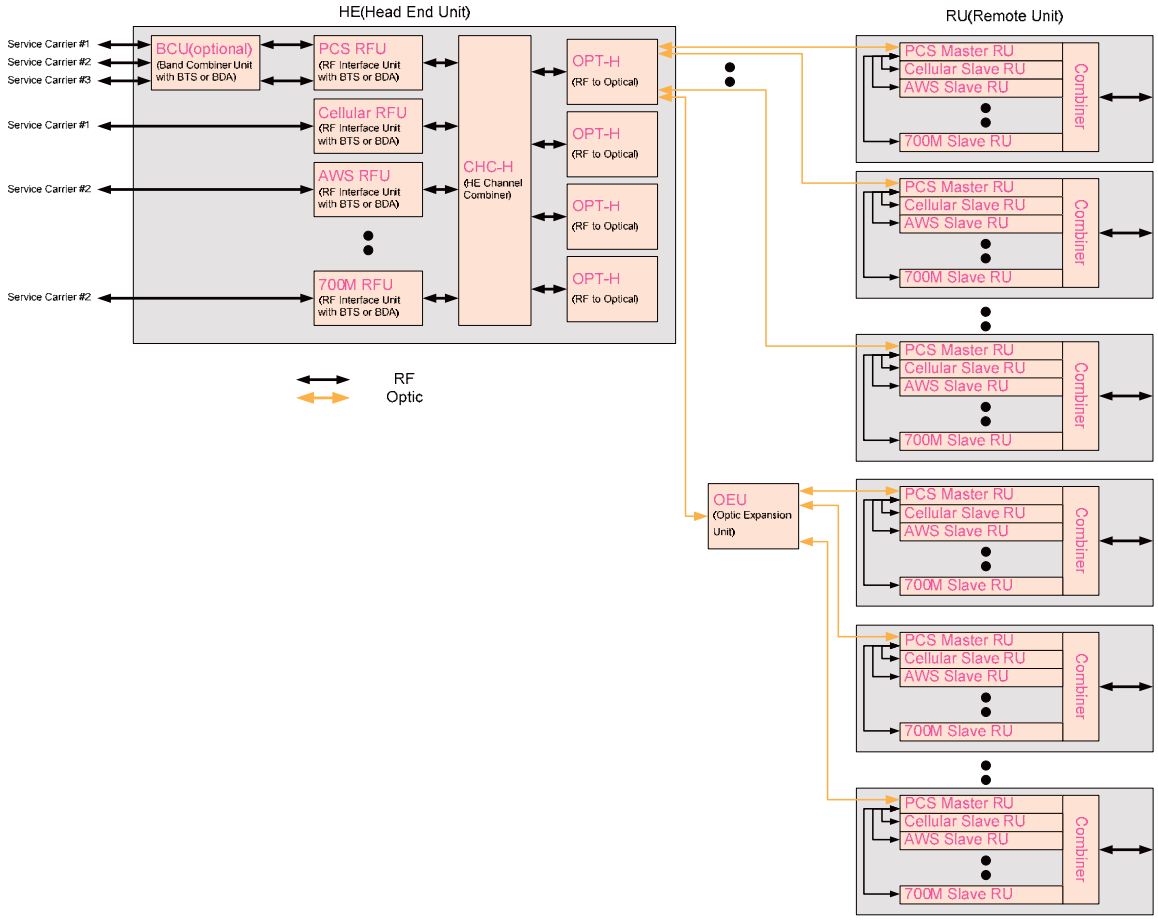



**Figure 2-2 ADX DAS Topology**

## 2.3 SISO Configuration

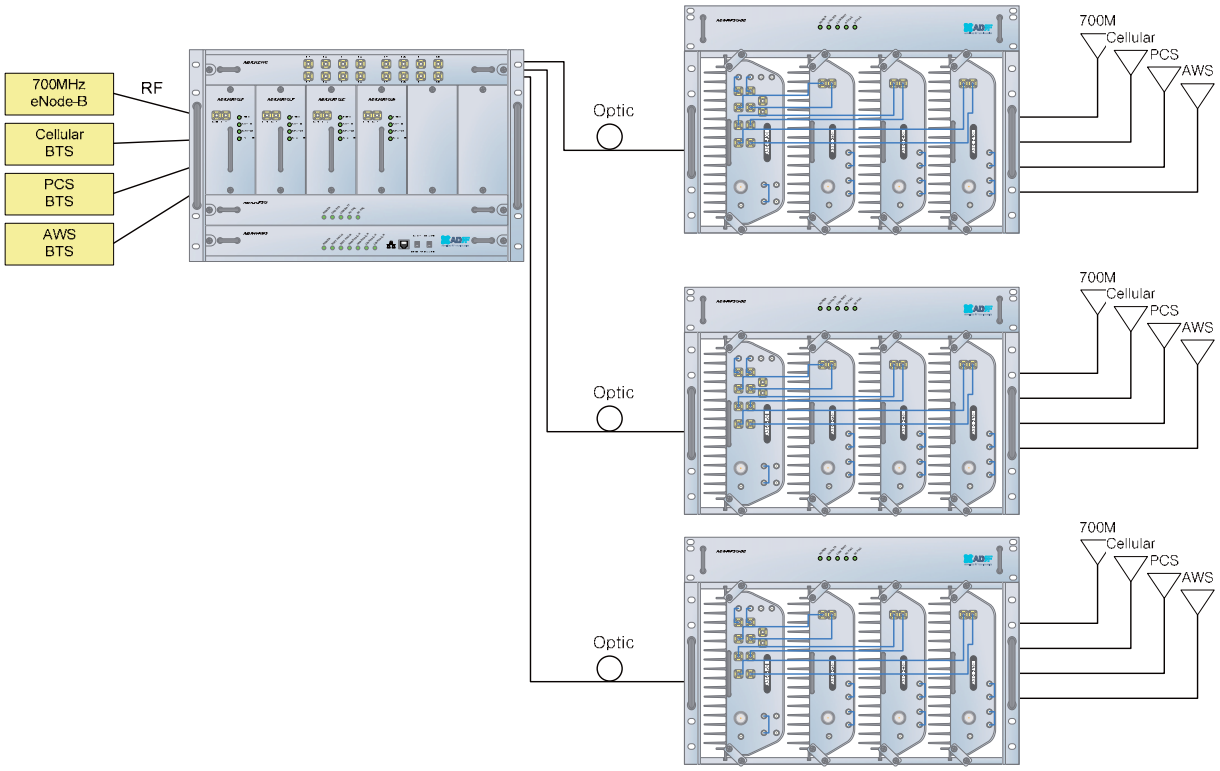



**Figure 2-3 ADX DAS SISO Configuration**

## 2.4 MIMO configuration

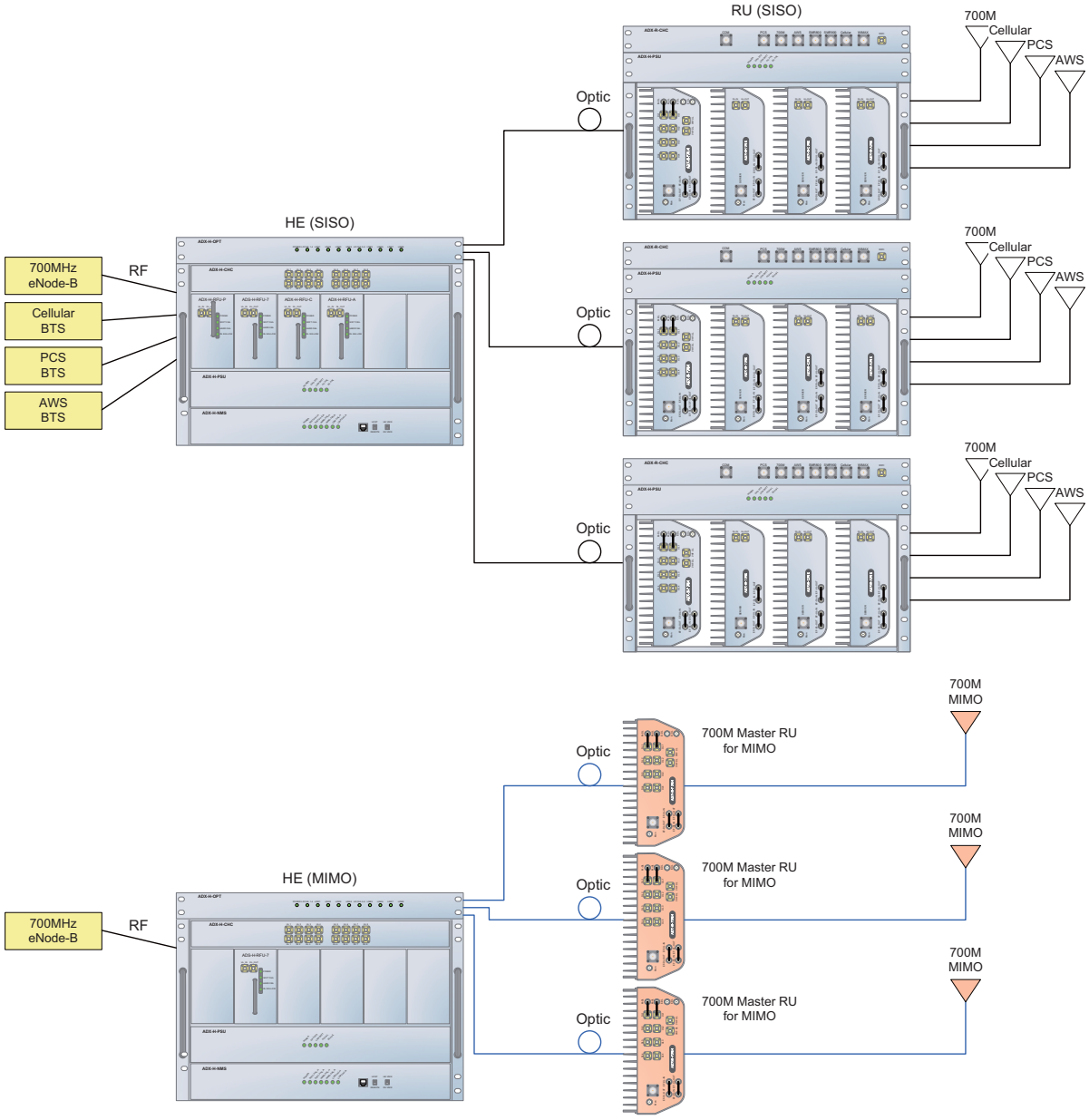



**Figure 2-4 ADX DAS MIMO Configuration**

- DAS system for MIMO can be supported by separate DAS System.
-

## 2.5 ADX-DAS Scalability

**Table 2-1 ADX-DAS Scalability**

| Unit | | | Scalability | Remarks |
|---|---|---|---|---|
| Supported band | Current | | 700M, Cellular, PCS, AWS | |
| | Future | Single Band | 700M including Lower C, SMR800/900, SMR700/800, VHF/UHF, BRS | BRS band (TDD system) will be supported as independent system. |
| | | Dual Band | PCS & SMR800/900, PCS & Cellular | |
| HE | RFU | | Up to 8 | up to 6: card type<br>7th & 8th RFU: 19" rack type |
| | NMS | | 1 | |
| | Channel Combiner | | 1 | |
| | Optic Unit | | Up to 4 | |
| | Band Combiner Unit | | Up to 4 | To support multiple carriers |
| | Power Supply Unit | | 1 | Capable of supplying power to 8 RFUs, 4 BCUs, 4 OPTs and NMS. |
| RU | RU | | Up to 32 | |
| | OEU | | Up to 4 | |
| | PSU | Adaptor type | 1 per Sub RU | |
| | | 19" rack mount | 1 | Capable of supplying power to 8 Sub RUs |

## 2.6

## 3. A DX OVERVIEW

### 3.1 Head End

HE Unit is composed of CHC-H, RFU, NMS, BCU, OPT and PSU.
ADX-HE can support up to 8 RFUs and 4 BCUs.

- Spec
  - Size: 19.0 x 14.6 x 12.2 inches (482 x 370 x 311 mm)
  - Weight: 83.7 lbs (38.0 Kg)@4 RFU, CHC-H, PSU and NMS
  - Power Consumption: 55W@4 RFU, 1 OPT and NMS, 28W@1 RFU, 1 OPT and NMS
  - Power Input: 110VAC or -48VDC(optional)
  - Can support an ADRF-BBU for external battery backup solution

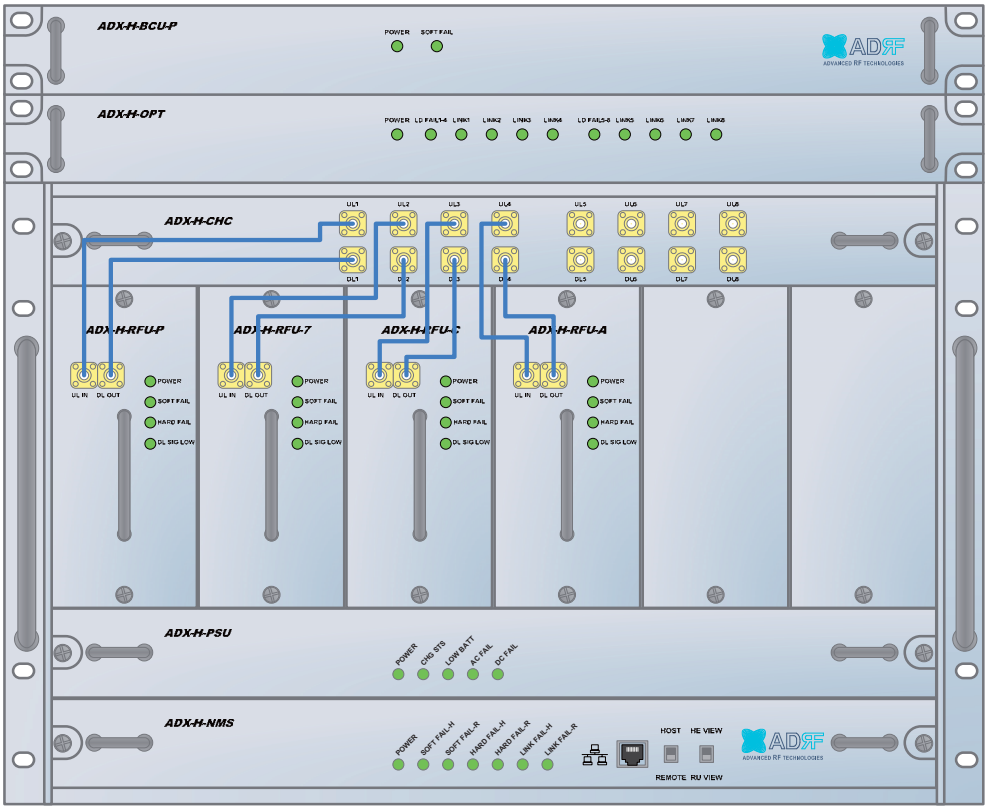



**Figure 3-1 Head End Front View**

### 3.1.1 NMS (Network Management System)

- Functions and features
  - Supports full SNMP v1,v2, and v3 (get, set & trap) and web-based GUI Interface.
  - Monitors alarms and status
  - Provides control interfaces with all subordinate modules
  - Provides overall DAS structure via the auto tree update function
- Spec
  - Size: 19.0 x 12.1 x 1.7 inches (482 x 307 x 44 mm)
  - Weight: 5.5 lbs (2.5 kg)


**Figure 3-2 ADX-H-NMS Front View**

#### 3.1.1.1 L EDs

NMS has LEDs on the front panel as shown in Figure 3-3.


**Figure 3-3 NMS LED**

**Table 3-1 NMS LED Specifications**

| ADX DAS-NMS | | Specifications |
|---|---|---|
| Power | Solid Green | NMS power is ON |
| | OFF | NMS power is OFF |
| SOFT FAIL-H | Solid Yellow | HE Soft Fail alarm exists in the system |
| | Solid Green | No HE Soft Fail alarms are present in the system |
| SOFT FAIL-R | Solid Yellow | RU Soft Fail alarm exists in the system |
| | Solid Green | No RU Soft Fail alarms are present in the system |
| HARD FAIL-H | Solid Red | HE Hard Fail alarm exists in the system |
| | Solid Green | No HE Hard Fail alarms are present in the system |
| HARD FAIL-R | Solid Red | RU Hard Fail alarm exists in the system |
| | Solid Green | No RU Hard Fail alarms are present in the system |
| LINK FAIL-H | Solid Yellow | HE Link Fail alarm exists in the system |
| | Solid Green | No HE Link Fail alarms are present in the system |
| LINK FAIL-R | Solid Yellow | RU Link Fail alarm exists in the system |
| | Solid Green | No RU Link Fail alarms are present in the system |

#### 3.1.1.2 Ethe rnet Port

The Ethernet port can be used to communicate directly with the ADX DAS using a RJ-45 crossover cable or can also be used to connect the ADX DAS to an external modem box.

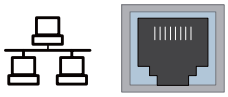


**Figure 3-4 Ethernet Port**

#### 3.1.1.3 H ost/Remote Switch

The Host/Remote Switch allows the user to switch the default Repeater IP, Subnet Mask, and Gateway of the repeater to an alternative setup. These settings can be adjusting by logging into the ADX DAS in HOST mode and configuring the settings under the Modem Box Setting section on the Install Page of NMS.

Once the settings are set, flipping the switch to the REMOTE position will reboot NMS module with the new alternate settings. *Please note that when the NMS is set to the REMOTE position, DHCP is disabled and the NMS will not automatically assign an IP address to any device that connects directly to the NMS.*


**Figure 3-5 Host/Remote Switch**

- Host IP: 192.168.63.1 (Fixed IP, unable to modify this IP address)
- Remote IP: 192.168.63.5 (Default IP, but can be modified in Host mode)

#### 3.1.1.4 HE View/RU View Switch

The HE View/RU View Switch allows the user to be able to disable periodic monitoring operated by NMS. In the HE view mode, NMS monitors the status of all subordinate units connected to NMS periodically but when switched to RU view the NMS does not monitor the subordinate units. When the user goes to a RU and wants to monitor/control the HE, the user should set the NMS as RU view mode before going to the RU. If not, there might be some data collisions between the NMS and RU, which may prevent the user from properly monitoring or configuring the HE when at the RU. Consequently, the user should set as HE view mode when the user is at the HE and should set as RU view mode when the user is at the RU.


**Figure 3-6 HE View/RU View Switch**

### 3.1.2 R FU (ADX-H-RFU-x)

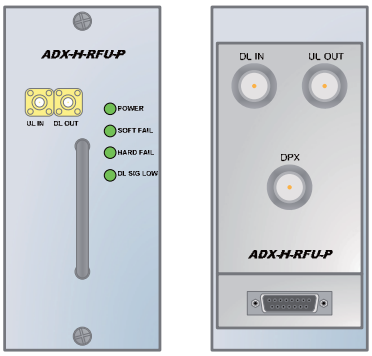



**Figure 3-7 RFU Front & Rear View**

- Functions and features
  - Provide RF interface with BTS or BDA
  - Each RFU has independent gain control and filtering
  - Modular type and Hot swappable
  - Supports duplex port or simplex TX & RX ports
  - Easily support additional frequency bands by adding a single RFU
  - Reduces complexity and overall equipment size
- Spec
  - Size: 12.8 x 6.2 x 2.8 inches (324 x 156.5 x 71.3 mm)
  - Weight: 7.3 lbs (3.3 kg)

#### 3.1.2.1 L EDs

RFU has LEDs on the front panel as shown in Figure 3-8.


**Figure 3-8 RFU LED**

**Table 3-2 RFU LED Specifications**

| ADX DAS-Module | | Specifications |
|---|---|---|
| Power | Solid Green | Module power is ON. |
| | OFF | Module power is OFF. |
| Soft Fail | Solid Yellow | Soft Fail alarm exists in the RFU. |
| | Solid Green | No Soft Fail alarms are present in the RFU. |
| Hard Fail | Solid Red | Hard Fail alarm exists in the RFU. |
| | Solid Green | No Hard Fail alarms are present in the RFU. |
| DL SIG LOW | Solid Yellow | When DL input signal level is lower than the defined threshold level. (default threshold value: -5dBm) |
| | Solid Green | When DL input signal level is upper than the defined |

| | | |
|---|---|---|
| | | threshold level. |

### 3.1.2.2 R F Ports

#### 3.1.2.2.1 DL IN/UL OUT & DPX ports

DL IN/UL OUT & DPX Ports (refer to Figure 3-7) are located at the back of RFU and can be connected directly to the BDA or the BTS. A BCU can be used before inserting the signal into the RFU if multiple multiple BDA or BTS sources exist. The RFU can support an incoming signal strength from 0 to 25 dBm.

#### 3.1.2.2.2 DL OUT/UL IN

DL OUT/UL IN Ports (refer to Figure 3-7) are located at the front of RFU and connect directly to the HE Channel Combiner (ADX-H-CHC).

### 3.1.2.3 C ommunication Port

ADX DAS-NMS monitors and controls a RFU via this port. DC Power is also provided to the RFU via this port.

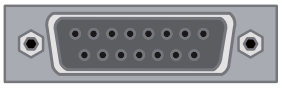


**Figure 3-9 Communication Port (RFU)**

### 3.1.3 C hannel Combiner (ADX-H-CHC)

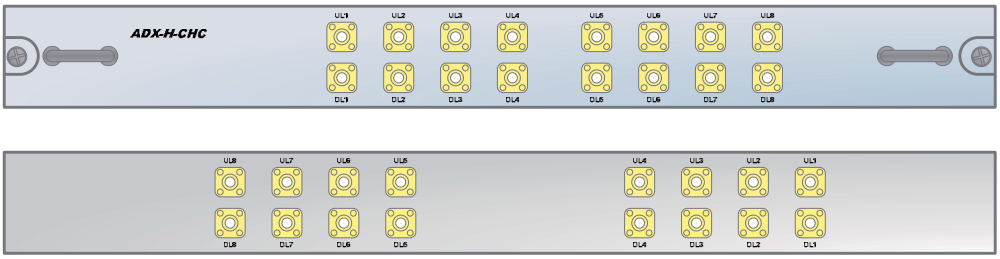



**Figure 3-10ADX-H-CHC Front & Rear View**

- Functions & Features
  - Combines DL signals received from each RFU and divides to all connected RUs
  - Combines UL signals received from each RU and divides to all connected RFUs
  - Supports up to 8 RFUs and (4) ADX-H-OPT
- Spec
  - Size: 16.9 x 12.9 x 1.7 inches (430 x 327 x 44 mm)
  - Weight: 11.0 lbs (5.0 kg)

### 3.1.3.1 R F ports

#### 3.1.3.1.1 RF ports at the front panel( DL 1 to DL 8, UL 1 to UL 8)

DL 1(to DL 8) & UL 1(to UL 8) RF ports are connected to DL OUT/UL IN Ports at the front panel of RFU.

- Receive the downlink signal from each RFU
- Split the uplink signal received from OPT to each RFU

#### 3.1.3.1.2 RF ports at the back panel( DL 1 to DL 8, UL 1 to UL 8)

DL 1(to DL 8) & UL 1(to UL 8) RF ports are connected to DL IN/UL OUT Ports at the back panel of OPT.

- Transfer the combined downlink signals to OPT
- Receive the uplink signal from OPT

### 3.1.4 Opt ic Unit (ADX-H-OPT)

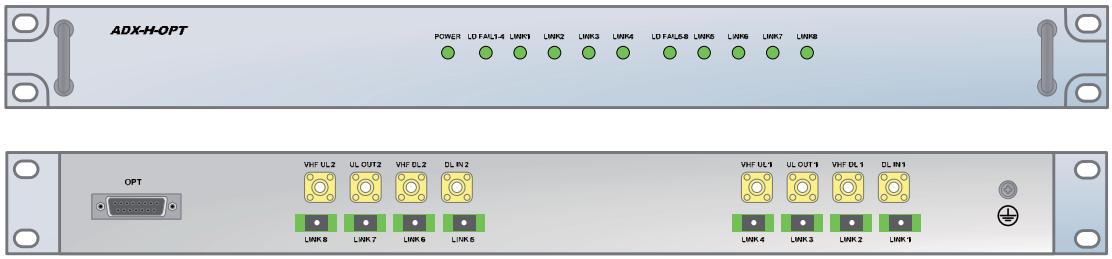



**Figure 3-11 ADX-H-OPT Front & Rear View**

- Functions & Features
  - Converts RF to optic signal and transports signals up to a maximum of 10Km (optical 5dBo loss including optical connection loss).
  - Supports up to (8) Master RUs
  - Minimizes the number of optic fiber cable neeed by transporting multi band signals over a single strand of fiber using WDM technology.
- Spec
  - Size: 19.0 x 12.9 x 1.7 inches (482 x 327 x 44 mm)
  - Weight: 13.2 lbs (6.0 kg)

#### 3.1.4.1 L EDs

The ADX-H-OPT has the following LEDs on the front panel as shown in Figure 3-12.


**Figure 3-12 OPT LED**

**Table 3-3 OPT LED Specifications**

| ADX DAS-Module | | Specifications |
|---|---|---|
| Power | Solid Green | Module power is ON |
| | OFF | Module power is OFF |
| LD FAIL 1-4/ LD FAIL 5-8 | OFF | ODU is not installed |
| | Solid Yellow | LD Fail alarm exists in the ODU |
| | Solid Green | No LD Fail alarm is present in the ODU |
| LINK1 to LINK8 | Solid Yellow | PD Fail alarm exists |
| | Solid Green | No PD Fail alarm is present |

#### 3.1.4.2 R F ports

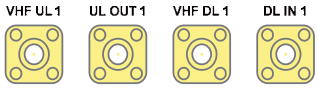



**Figure 3-13 OPT RF Ports**

##### 3.1.4.2.1 DL IN/UL OUT

The combined downlink signal received from ADX-H-CHC is transferred to the DL IN 1(or 2) at the back of OPT.

UL OUT is connected to one port among UL 1 to UL 8 ports at the back panel of ADX-H-CHC.

#### 3.1.4.2.2 VHF DL/VHF UL

VHF DL/UHF UL is used to support Public Safety in the VHF & UHF frequency band. VHF/UHF signals for Public Safety are not combined by ADX-H-CHC but VHF/UHF signals received from RFU for VHF/UHF are directly connected to the VHF DL/UHF UL port of OPT.

### 3.1.4.3 Opt ic ports


**Figure 3-14OPT Optic Ports**

One ADX-H-OPT has (8) optic ports and can support up to (8) Master RU's.

### 3.1.4.4 C ommunication Port

ADX-H-NMS monitors and controls a OPT via this port. DC Power is provided from the PSU to a OPT via this port.

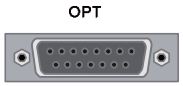



**Figure 3-15Communication Port (OPT)**

## 3.1.5 Power Supply Unit (ADX-H-PSU)

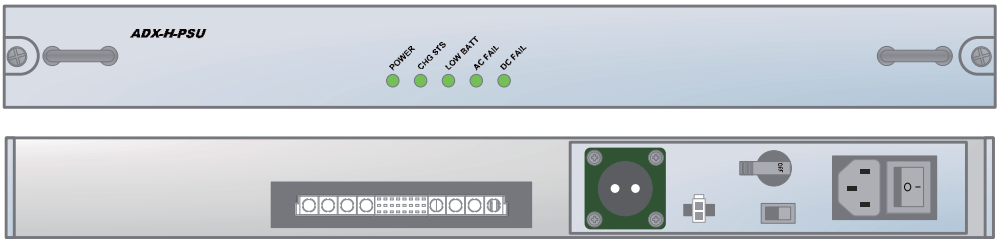



**Figure 3-16ADX-H-PSU Front & Rear View**

- Functions & Features
  - Capable of supplying power to 8 RFUs, 4 BCUs, 4 OPTs and NMS
  - Support Battery Backup via ADRF-BBU
- Spec
  - Size: 16.9 x 13.1 x 1.7 inches (430 x 332.7x 44 mm)
  - Weight: 7.7lbs (3.5 kg)
  - Power Input: 110V or 220VAC, selectable by switch

### 3.1.5.1 L EDs

ADX-H-PSU has the following LEDs on the front panel as shown in Figure 3-17.


**Figure 3-17HE PSU LED**

Table 3-4 HE PSU LED Specifications

| ADX DAS-Module | | Specifications |
|---|---|---|
| Power | Solid Green | Module power is ON |
| | OFF | Module power is OFF |
| CHG STS | Solid Yellow | No AC power is available and ADRF-BBU is being used |
| | Blinking Green | PSU is charging the ADRF-BBU |
| | Solid Green | ADRF-BBU is completely charged |
| | OFF | Battery is not connected |
| LOW BATT | Solid Yellow | Low Battery alarm exist in the PSU |
| | Solid Green | No Low Battery alarm is present in the PSU |
| AC FAIL | Solid Yellow | AC Fail alarm exists in the PSU |
| | Solid Green | No AC Fail alarm is present in the PSU |
| DC FAIL | Solid Yellow | DC Fail alarm exists in the RFU |
| | Solid Green | No DC Fail alarms is present in the PSU |

### 3.1.5.2 AC Input On/Off Switch, AC Input Port and AC Input Selection Switch

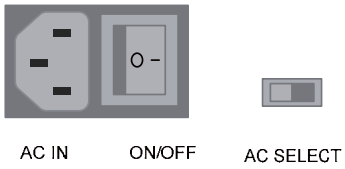



Figure 3-18 HE PSU AC Input On/Off Switch, AC Input Port and AC Input Selection Switch

The AC Power on/off switch is located at the back panel of HE PSU. HE PSU can be operated at the AC110V and AC220V input but AC Input Voltage should be selected properly through AC input voltage selection switch by the user.

### 3.1.5.3 Battery Backup Port, Battery Install Port and Battery Backup Switch

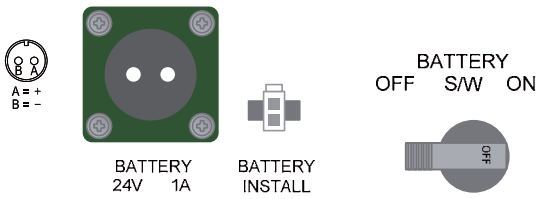



Figure 3-19 Battery Backup Port, Battery Install Port and Battery Backup Switch

The Battery Switch can be used to provide power to the optional External Backup Battery (ADRF-BBU) (Figure 3-19).

The HE PSU can be connected to an ADRF-BBU (ADRF Battery Backup Unit) to provide power during a power failure. If an ADRF-BBU is utilized, connect the ADRF-BBU to the HE PSU via the external battery backup port as shown in Figure 3-19.

(WARNING: The circuit switch on the ADRF-BBU must be set to OFF before connecting the ADRF-BBU to the HE PSU to prevent damage to the HE PSU or the ADRF-BBU and personal injury.)

Note: Please contact ADRF Technical Support for assistance if you are unfamiliar with the installation procedure of our battery box.

The Battery Install port is used to let NMS know if an ADRF-BBU is connected to the HE PSU or not. If an ADRF-BBU is connected without the cable connection to Battery Install port, the ADX-H-NMS will not detect the ADRF-BBU.

**The procedure for connecting HE PSU to BBU**

1. BATT S/W OFF
2. Connect ADRF-BBU to HE PSU Battery port and Battery Install port using HE battery cable
3. BATT S/W ON

### 3.1.6 Optional Band Combiner Unit (ADX-H-BCU-x)

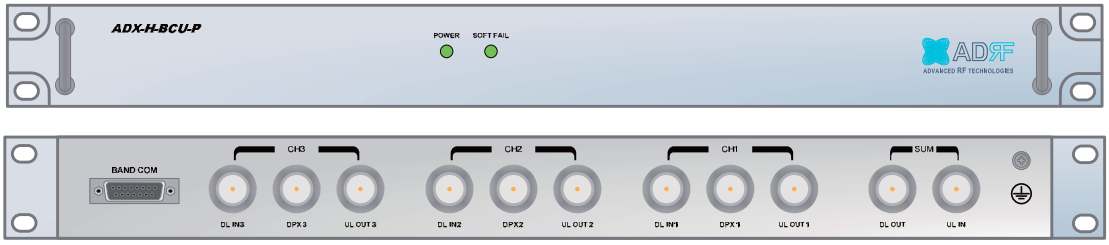



**Figure 3-20 ADX-H-BCU Front & Rear View**

- Functions & Features
  - Combines and balances up to 3 carriers' signals
  - Easily adds multiple carriers' signals without adding equipment
  - Reduces complexity and expansion costs to support multiple carriers' signals
- Spec
  - Size: 19.0 x 12.9 x 1.7 inches (482 x 327 x 44 mm)
  - Weight: 13.2 lbs (6.0 kg)

#### 3.1.6.1 L EDs

BCU has LEDs on the front panel as shown in Figure 3-21.


**Figure 3-21 BCU LED**

**Table 3-5 BCU LED Specifications**

| ADX DAS-Module | | Specifications |
|---|---|---|
| Power | Solid Green | Module power is ON |
| | OFF | Module power is OFF |
| Soft Fail | Solid Yellow | Soft Fail alarm exist in the RFU |
| | Solid Green | No Soft Fail alarms are present in the RFU |

#### 3.1.6.2 R F Ports

##### 3.1.6.2.1 DL IN/UL OUT & DPX ports

DL IN/UL OUT & DPX Ports are located at the back of BCU and connect directly to the BDA or BTS.

##### 3.1.6.2.2 DL OUT/UL IN

DL OUT/UL IN Ports are located on the back of BCU and connect directly to the RFU.

#### 3.1.6.3 C ommunication Port

ADX-H-NMS monitors and controls a BCU via this port. DC Power is provided from PSU to a BCU via this port.

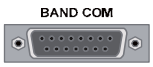



**Figure 3-22 Communication Port (BCU)**

### 3.1.7 Optional Optic Expansion Unit (ADX-H-OEU)

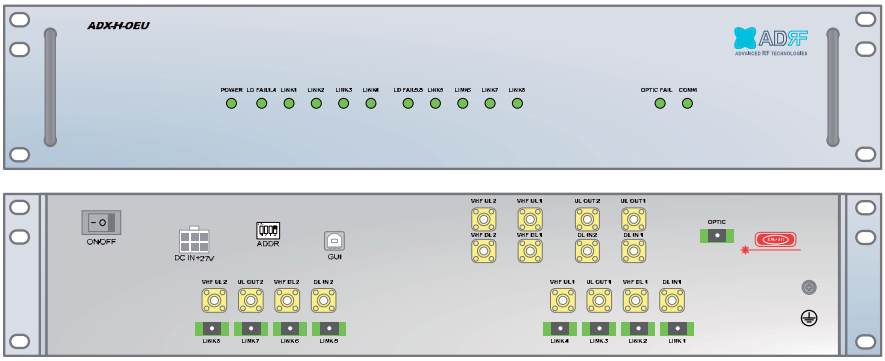



**Figure 3-23 ADX-H-OEU Front & Rear View**

- Functions & Features
  - Used to extend DAS coverage to other buildings
  - Drives up to (8) additional Master RUs
  - Provides DAS coverage in remote building with minimized equipment and minimum optic line
- Spec
  - Size: 19.0 x 12.8 x 3.5 inches (482 x 325 x 89 mm)
  - Weight: TBD lbs (TBD kg)
  - Power Input: 110VAC or -48VDC(optional)

#### 3.1.7.1 L EDs

OEU has the following LEDs on the front panel as shown in Figure 3-12.

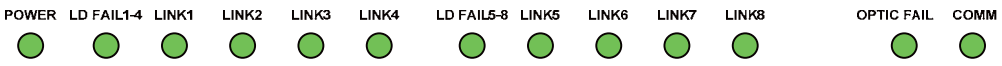



**Figure 3-24 OPT LED**

**Table 3-6 OPT LED Specifications**

| ADX DAS-Module | | Specifications |
|---|---|---|
| Power | Solid Green | Module power is ON |
| | OFF | Module power is OFF |
| LD FAIL 1-4/ LD FAIL 5-8 | OFF | ODU is not installed |
| | Solid Yellow | LD Fail alarm exist in the OEU |
| | Solid Green | No LD Fail alarm is present in the OEU |
| LINK1 to LINK8 | Solid Yellow | PD Fail alarm exist |
| | Solid Green | No PD Fail alarm is present |
| Optic Fail | Solid Yellow | Optic Fail alarm exist in the OEU |
| | Solid Green | No Optic Fail alarm is present in the OEU |
| COMM | Solid Yellow | COMM Fail alarm exist in the OEU |
| | Solid Green | No COMM Fail alarm is present in the OEU |

#### 3.1.7.2 Opt ic ports

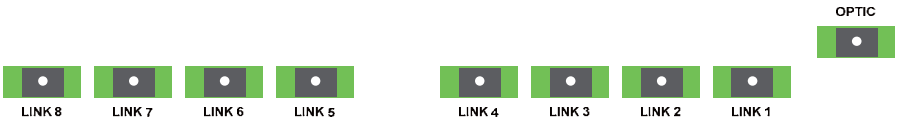



**Figure 3-25OEU Optic Ports**

- OPTIC port
  - connected to OPT of HE
- LINK 1~8 ports
  - connected to extended RUs

### 3.1.7.3 DC Power Input port & GUI Port


**Figure 3-26DC Power Input Port & GUI Port**

- DC IN Port
  - Connect DC output of AC/DC adaptor to the OEU's DC IN Port
- GUI Port
  - Connects to laptop via USB cable (32-bit/64-bit Windows only supported)
  - Used for interal purposes only

### 3.1.7.4 Power On/Off Switch & ADDR


**Figure 3-27Power On/Off Switch & ADDR**

- ON/OFF switch
  - OEU Power On/Off switch
- ADDR switch
  - The ID of OEU can be set manually using ADDR switch in case the ID of OEU is not correctly assigned automatically.

### 3.1.7.5 O EU Block Diagram

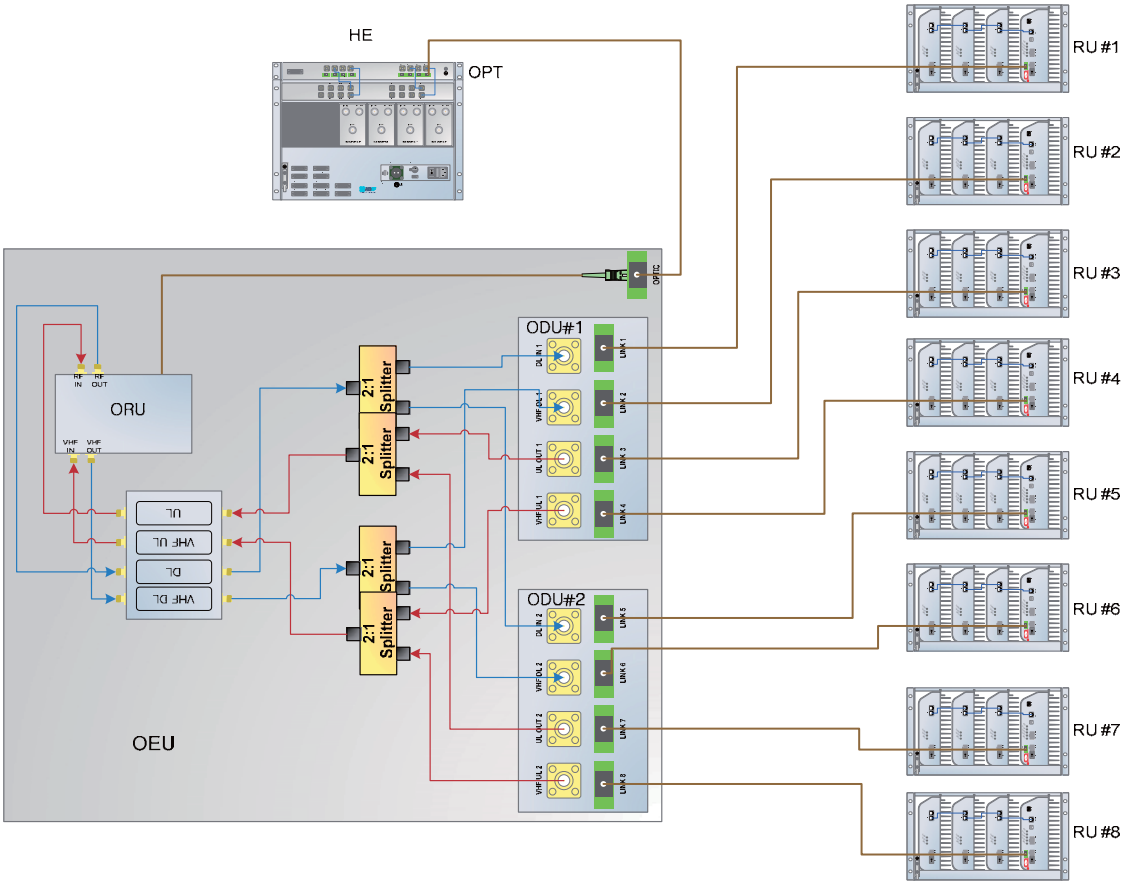



**Figure 3-28 OEU Block Diagram**

### 3.2 RU (ADX-R-x30M/S)

RU is composed of a (1) Master RU and up to (7) Slave RU's (use the use of ADX-R-4WS). A power supply, either the ADX-R-ADP (supports [1] Master/Slave RU) or ADX-R-PSU-30 (supports up to [8] Master/Slave RU) is required.

- Spec
  - Size: 19.0 x 12.9 x 10.5 inches (482 x 328.2 x 266.5 mm)
  - Weight: 61.0 lbs (27.7 kg)
  - Power Input: 110VAC or -48VDC(optional)
  - Battery Backup supported

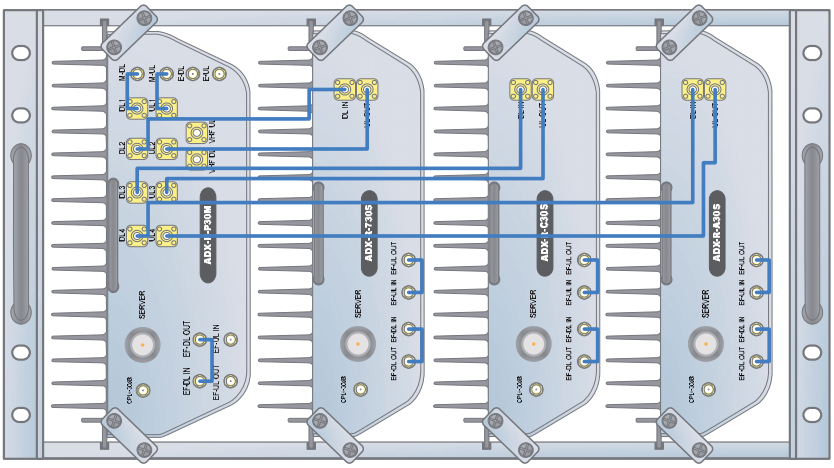


**Figure 3-29 RU Front View**

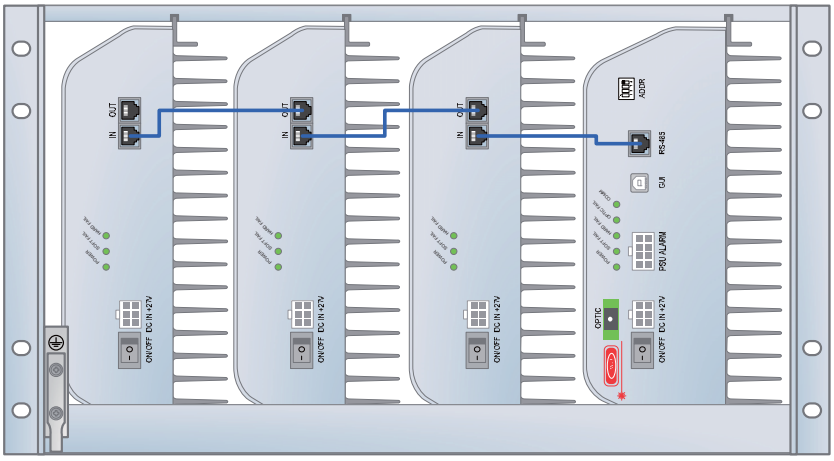


**Figure 3-30 RU Rear View**

### 3.2.1 M aster RU (ADX-R-x30M)

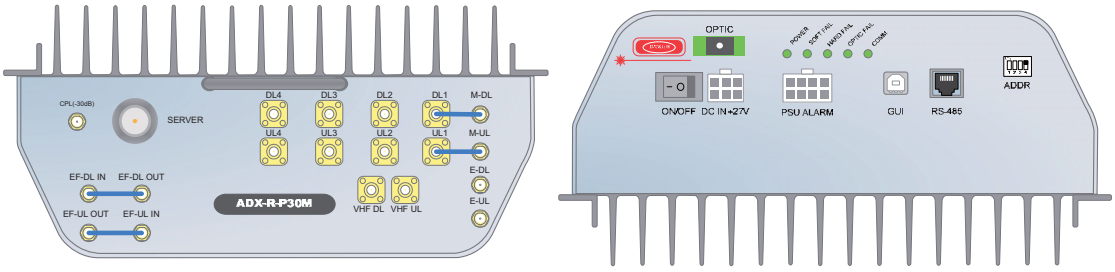



**Figure 3-31 Master RU Front & Rear View**

- Functions & Features
  - Converts optic signal into RF signal
  - Divides and provides RF signals to Slave RU
  - Transmits DL signal and receives UL signal through server antenna
  - Drive up to 7 slave RUs
  - Eliminate the need of fans by applying convection cooling structure for wall mount application
  - Efficiently solves out of band interference problems by supporting external filters
  - Easy to install and add RUs since each RU is independent and modular
- Spec
  - Size: 11.8 x 9.8 x 4.5 inches (300 x 249.6 x 114.5 mm)
  - Weight: 13.2 lbs (6.0 kg)

#### 3.2.1.1 L EDs

Master RU's have the following LEDs on the front panel as shown in Figure 3-32.


**Figure 3-32 Master RU LED**

**Table 3-7 Master RU LED Specifications**

| ADX DAS-Module | | Specifications |
|---|---|---|
| Power | Solid Green | Module power is ON |
| | OFF | Module power is OFF |
| Soft Fail | Solid Yellow | Soft Fail alarm exists in the Master RU |
| | Solid Green | No Soft Fail alarms are present in the Master RU |
| Hard Fail | Solid Red | Hard Fail alarm exists in the Master RU |
| | Solid Green | No Hard Fail alarms are present in the Master RU |
| Optic Fail | Solid Yellow | Optic Fail alarm exists in the Master RU |
| | Solid Green | No Optic Fail alarm is present in the Master RU |
| COMM | Solid Yellow | COMM Fail alarm exists in the Master RU |
| | Solid Green | No COMM Fail alarm is present in the Master RU |

### 3.2.1.2 R F Ports

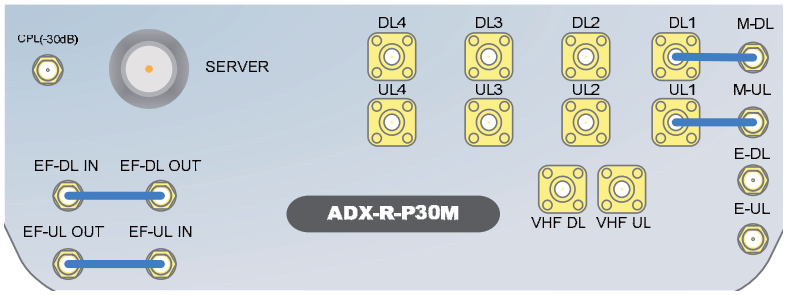



**Figure 3-33RF Ports (Master RU)**

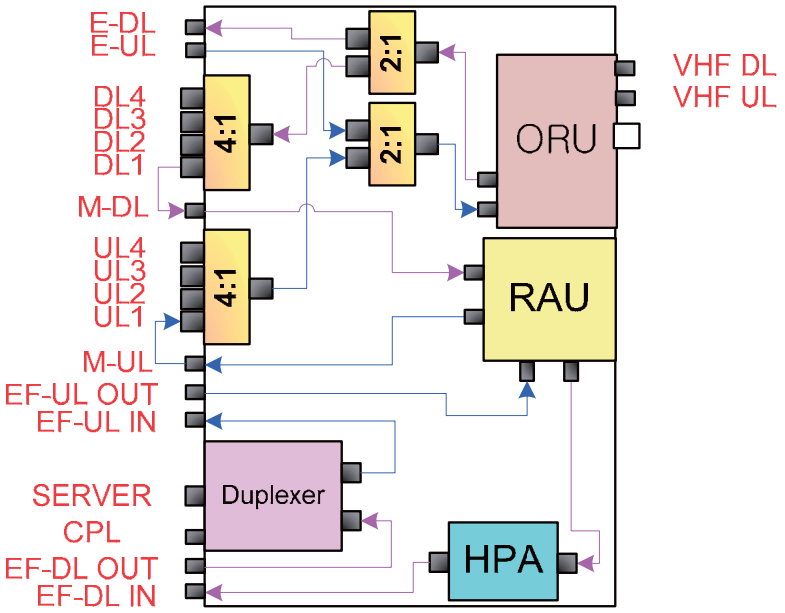



**Figure 3-34Master RU block Diagram and RF Port Name**

#### 3.2.1.2.1 M-DL/M-UL, DL1 to DL4 & UL1 to UL4

- M-DL/M-UL ports
  - Master RU units will come with the M-DL and M-UL ports pre-connectedt to the DL1 and UL1 ports.
- DL2 to DL4 & UL2 to UL4 ports
  - DL2 through DL4 and UL2 through UL4 ports are used to connect additional Slave RU units.

#### 3.2.1.2.2 E- DL/E-UL

- Used to support additional (4) Slave RU units in addition to the (1) Master RU unit and (3) Slave RU units already being utlized
- An ADX-R-4WS is required if utilizing the E-DL/E-UL ports
- ADX-R-4WS divides the output of E-DL port to extended slave RUs and combines/transfers UL signal received from extended slave RUs to E-UL port. (refer to section 3.2.4, Figure 4-4)

#### 3.2.1.2.3 VHF DL/VHF UL

- Used to support Slave RU for public safety service of VHF/UHF band (ADX-R-V30S)

### 3.2.1.2.4 SERVER & CPL

- Server Port
  - Connected to Server Antenna or RU channel combiner (ADX-R-CHC).
- CPL Port
  - 30dB coupling port of Server port.

### 3.2.1.2.5 EF-DL IN/EF-DL OUT & EF-UL IN/EF- UL OUT

- Can be connected to the DL/UL external filter
- DL external filter can be used to reduce DL out-band emissions
- UL external filter can be used to reduce out-band frequenies

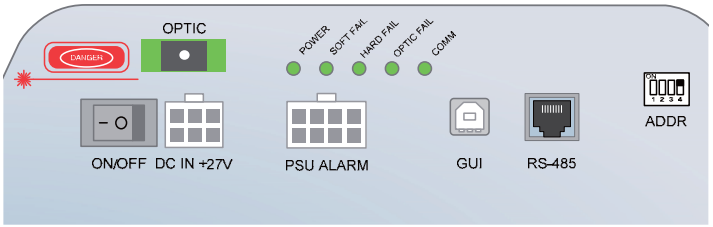



**Figure 3-35Ports at the back panel (Master RU)**

### 3.2.1.3 O ptic Port

- Connets to ADX-H-OPT via optic line

### 3.2.1.4 Power On/Off Switch & DC IN Port

- Power On/Off switch
  - Master RU Power On/Off switch
- DC IN Port
  - Connected to DC output port of AC/DC adaptor (ADX-R-ADP-30) or RU PSU (ADX-R-PSU-30)

### 3.2.1.5 P SU Alarm Port

- Connected to the ADX-R-PSU-30
- NMS & master RU can monitor the status of RU PSU via this port

### 3.2.1.6 G UI Port

- Connects to a laptop via USB cable
- Monitor/control the RU and the HE connected to the RU using User GUI, which is a Windows based program. ADRF 32-bit or 64-bit drivers will also be required to access the RU using the User GUI.

### 3.2.1.7 R S-485 Port

- Slave RU should be connected to master RU in a diasy chain structure using RS-485 line to monitor and control slave RUs.
- The RS-485 cable connected to master RU should be connected to RS-485 IN port of slave RU. When a slave RU is connected to another slave RU, then the RS-485 cable should be connected from the RS-485 OUT port to the RS-485 IN of the 2nd Slave RU. (Figure 3-36)
- If RS-485 port connections between sub RUs are not correct, master RU will not be able to recognize all subordinate slave RUs. (Figure 3-37)
- ***WARNING! The RS-485 ports should NEVER be connected to the Enthernet port of laptop or Ethernet Network Equipment. Doing so may cause serious damage to the sub RUs or network equipments. (Figure 3-38)***

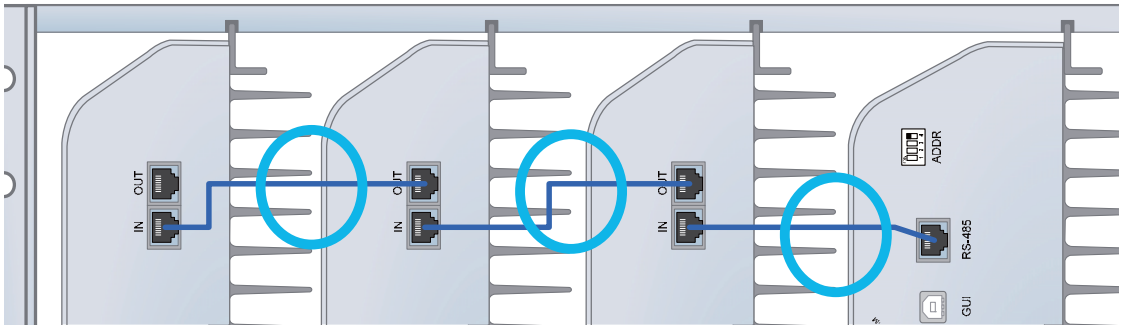



**Figure 3-36 Correct RS-485 connection between Master RU and Slave RU or between Slave RUs**

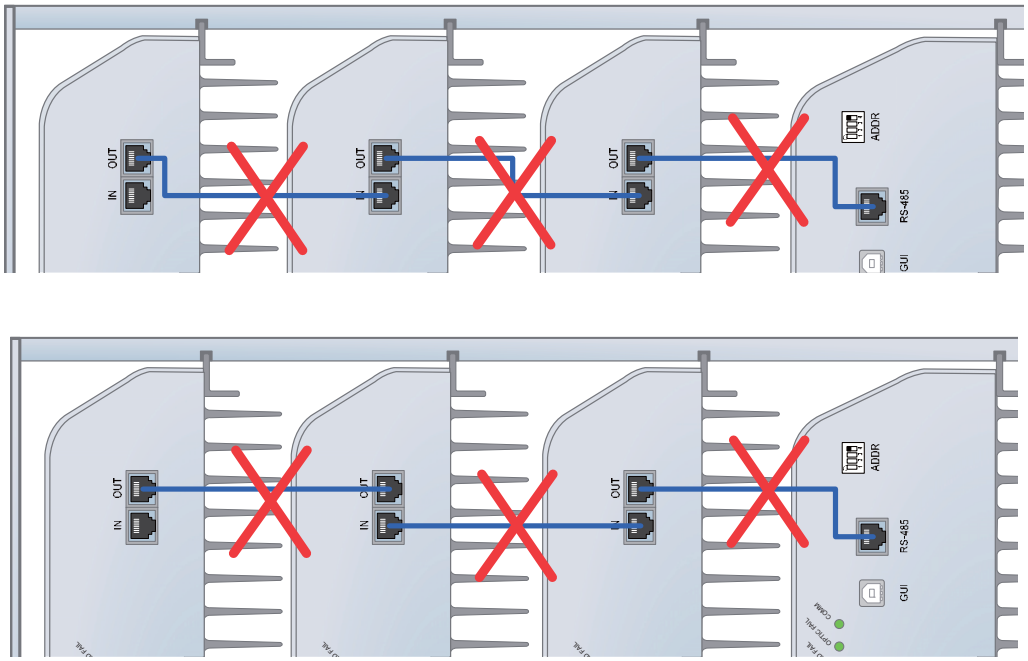



**Figure 3-37 Wrong RS-485 connection between Master RU and Slave RU or between Slave RUs**

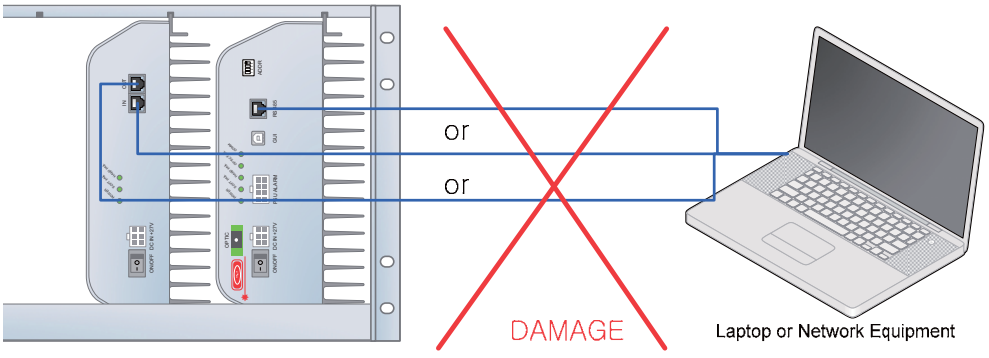



**Figure 3-38 Do NOT connect RS-485 ports of Sub RU to network equipment port**

### 3.2.1.8 A DDR

- The ID of master RU can be set manually using ADDR switch. This switch should only be use if instructed by ADRF Technical Support.

### 3.2.2 Slave RU (ADX-R-x30S)

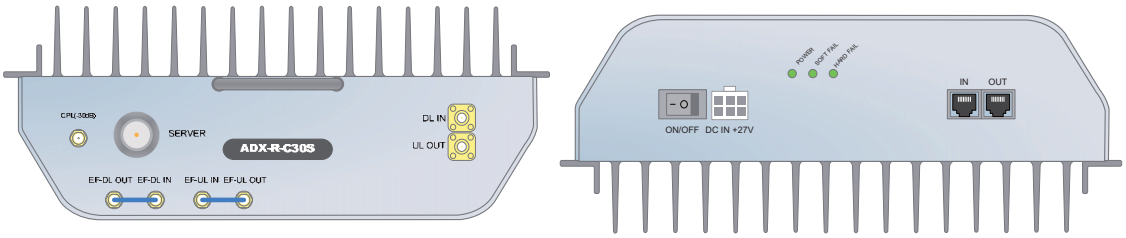



**Figure 3-39 Slave RU Front & Rear View**

- Functions & Features
  - Transmits DL signal and receives UL signal through server antenna port
  - Eliminate the need for fans by applying convection cooling structure for wall mount application
  - Efficiently solves out of band interference problems by supporting external filter
  - Easy to install and add RUs since each RU is independent and modular
- Spec
  - Size: 11.8 x 9.8 x 3.7 inches (300 x 249.6 x 94.5 mm)
  - Weight: 11.7 lbs (5.3 kg)

### 3.2.2.1 L EDs

ADX DAS has the following LEDs on the front of the Slave RU as shown below in Figure 3-32.


**Figure 3-40 Slave RU LED**

**Table 3-8 Slave RU LED Specifications**

| ADX DAS-Module | | Specifications |
|---|---|---|
| Power | Solid Green | Module power is ON |
| | OFF | Module power is OFF |
| Soft Fail | Solid Yellow | Soft Fail alarm exists in the Slave RU |
| | Solid Green | No Soft Fail alarms are present in the Slave RU |
| Hard Fail | Solid Red | Hard Fail alarm exists in the Slave RU |
| | Solid Green | No Hard Fail alarms are present in the Slave RU |

### 3.2.2.2 R F Ports

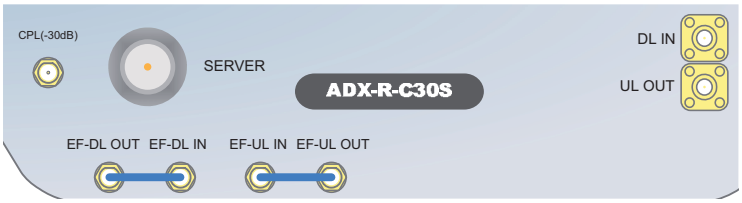



**Figure 3-41 RF Ports (Slave RU)**

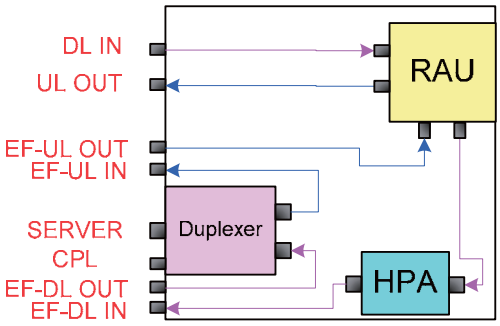



**Figure 3-42 Slave RU block Diagram and RF Port Name**

#### 3.2.2.2.1 DL IN & UL OUT

- Connects to one of the avaialble DL 2 to 4/UL 2 to 4 ports of master RU
- DL IN port receives the divided DL output of master RU
- UL OUT port transfers the UL output of slave RU to master RU

#### 3.2.2.2.2 SERVER & CPL

- Server Port
  - Connects to a Server Antenna or RU channel combiner (ADX-R-CHC)
- CPL Port
  - 30dB coupling port from the Server port

#### 3.2.2.2.3 EF-DL IN/EF-DL OUT & EF-UL IN/EF- UL OUT

- Can be connected to the DL/UL external filter
- DL external filter can be used to reduce out-band emissions
- UL external filter can be used to reduce uplink out-band signals

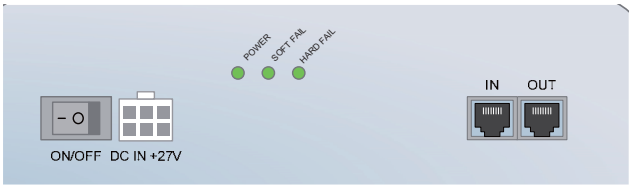



**Figure 3-43 Ports at the rear panel (Slave RU)**

### 3.2.2.3 Power On/Off Switch & DC IN Port

- Power On/Off switch
  - Slave RU Power On/Off switch
- DC IN Port
  - Connected to DC output port of AC/DC adaptor (ADX-R-ADP-30) or RU PSU (ADX-R-PSU-30)

### 3.2.2.4 R S-485 Port

- Slave RU is connected to master RU or other slave RU in a diasy chain structure using RS-485 line to monitor and control slave RUs.
- The RS-485 cable connected to master RU should be connected to RS-485 IN port of slave RU. When a slave RU is connected to another slave RU, then the RS-485 cable should be connected from the RS-485 OUT port to the RS-485 IN of the 2nd Slave RU. (Figure 3-36)
- If RS-485 port connections between sub RUs are not correct, master RU will not be able to recognize all subordinate slave RUs. (Figure 3-37)
- ***WARNING! The RS-485 ports should NEVER be connected to the Enthernet port of laptop or Ethernet Network Equipment. Doing so may cause serious damage to the sub RUs or network equipments. (Figure 3-38)***

### 3.2.3 RU Power Supply Options

#### 3.2.3.1 RU Power Adapter (ADX-R-ADP)

One power adapter can support up to (1) sub-RU.

#### 3.2.3.2 RU PSU (ADX-R-PSU-30)

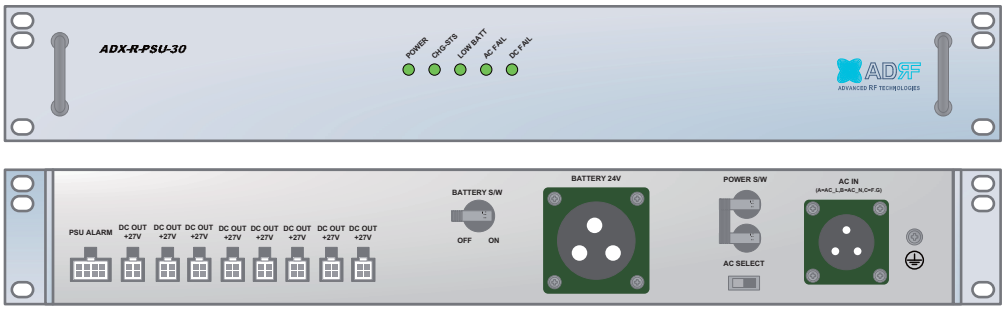



**Figure 3-44RU PSU Front & Rear View**

- Functions & Features
  - Capable of supplying power to 8 Sub Rus (Master/Slave RU)
  - Support Battery Backup (24V DC output)
- Spec
  - Size: 19.0 x 12.0 x 2.6 inches (482 x 304x 66 mm)
  - Weight: 9.9lbs (4.5 kg)
  - Power Input: 110V or 220VAC, selectable by switch

#### 3.2.3.3 L EDs

ADX DAS has the following LEDs on the front of the RU PSU as shown below in Figure 3-45.


**Figure 3-45RU PSU LED**

**Table 3-9 RU PSU LED Specifications**

| ADX DAS-Module | | Specifications |
|---|---|---|
| Power | Solid Green | Module power is ON |
| | OFF | Module power is OFF |
| CHG STS | Solid Yellow | No AC power detected and ADRF-BBU is being used |
| | Blinking Green | ADRF-BBU is being charged |
| | Solid Green | Completely Charged |
| | OFF | Battery is not connected |
| LOW BATT | Solid Yellow | Low Battery alarm exist in the PSU |
| | Solid Green | No Low Battery alarm is present in the PSU |
| AC FAIL | Solid Yellow | AC Fail alarm exist in the PSU |
| | Solid Green | No AC Fail alarm is present in the PSU |
| DC FAIL | Solid Yellow | DC Fail alarm exist in the RFU |
| | Solid Green | No DC Fail alarms is present in the PSU |

### 3.2.3.4 AC Input On/Off Switch, AC Input Port and AC Input Selection Switch

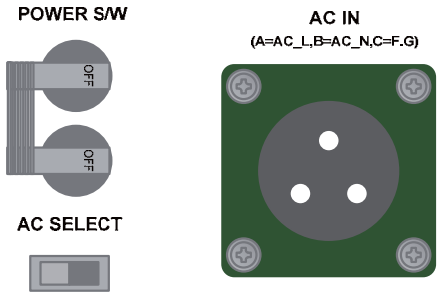



**Figure 3-46 RU PSU Power Switch View**

The AC Power on/off switch is located at the back panel of ADX-R-PSU-30. The ADX-R-PSU-30 can be operated at the AC110V and AC220V input but AC Input Voltage should be selected properly through AC input voltage selection switch by the user.

### 3.2.3.5 Battery Backup Port and Battery Backup Switch

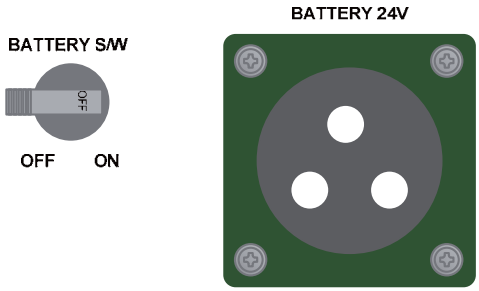



**Figure 3-47 Battery Backup Port & Battery Backup Switch**

The Battery Switch can be used to provide power to the optional ADRF-BBU (External Backup Battery) (Figure 3-47).

The RU PSU can be connected to an ADRF-BBU (ADRF Battery Backup Unit) to provide power during a power failure. If an ADRF-BBU is utilized, connect the ADRF-BBU to the RU PSU via the external battery backup port as shown in Figure 3-47.

***(WARNING: The circuit switch on the ADRF-BBU must be set to OFF before connecting the ADRF-BBU to the HE PSU to prevent damage to the HE PSU or the ADRF-BBU and personal injury.)***

Note: Please contact ADRF Technical Support for assistance if you are unfamiliar with the installation procedure of our battery box.

**The procedure for connecting RU PSU to BBU**

1. BATT S/W OFF
2. Connect BBU to RU PSU Battery port using RU battery cable
3. BATT S/W ON

### 3.2.3.6 DC Output Port


**Figure 3-48 DC Output Port (RU PSU)**

- The number of DC output port: 8
- DC Output Ports provide DC Power up to 8 Sub RUs.

### 3.2.3.7 P SU Alarm Port


**Figure 3-49 PSU Alarm Port (RU PSU)**

- Connects to master RU
- NMS & master RU can monitor the status of the ADX-R-PSU-30 via this port.

### 3.2.4 Optional 4-Way Combiner (ADX-R-4WS)


**Figure 3-50 ADX-R-4WS Front View**

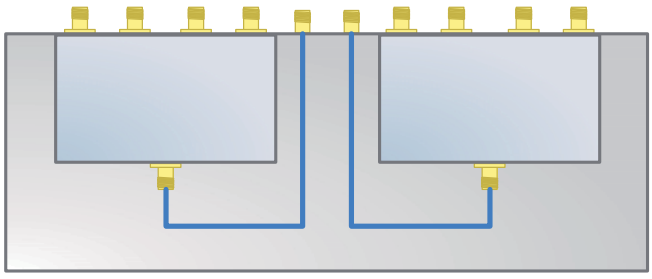


**Figure 3-51 ADX-R-4WS Inner View**

- ADX-R-4WS is required to when more than 4 sub-RU's are being used
- ADX-R-4WS connects to E-DL/E-UL port of master RU
- ADX-R-4WS divides the output of E-DL port into extended slave RUs

- ADX-R-4WS combines/transfers UL signal received from extended slave RUs to E-UL port (refer to Figure 4-4)

## 4. C ABLE CONNECTION

### 4.1 Head End Connection Diagrams

#### 4.1.1 Front/Rear Head End Connection View with Optional BCU unit

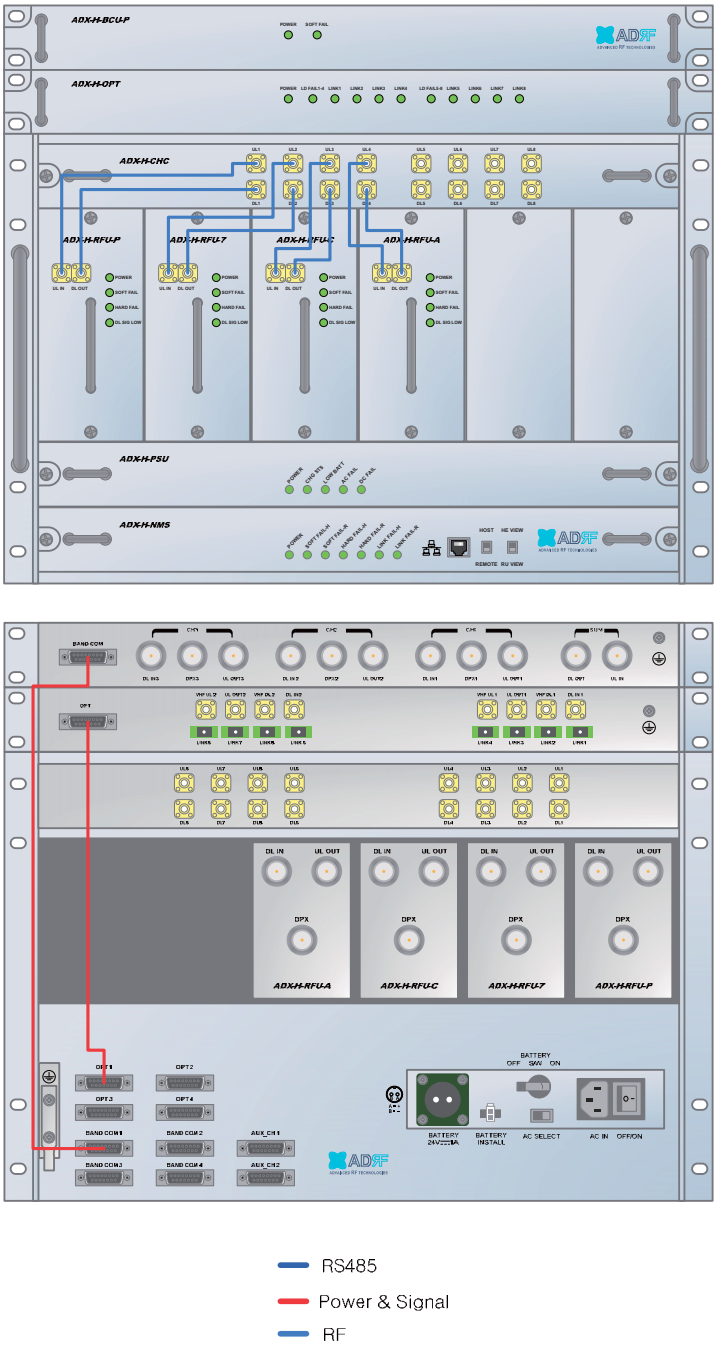



**Figure 4-1 HE Cable connection (1 OPT+1 BCU)**

### 4.1.2 Rear Head End Connection View with (4) OPT units

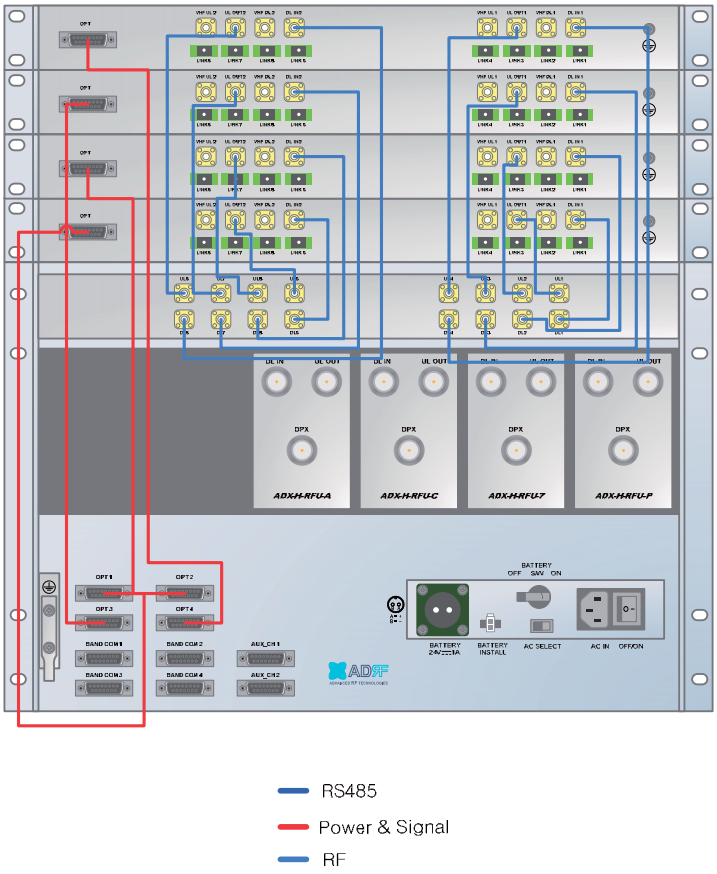



**Figure 4-2 HE Cable connection (4 OPTs)**

## 4.2 Remote Unit Connection Diagrams

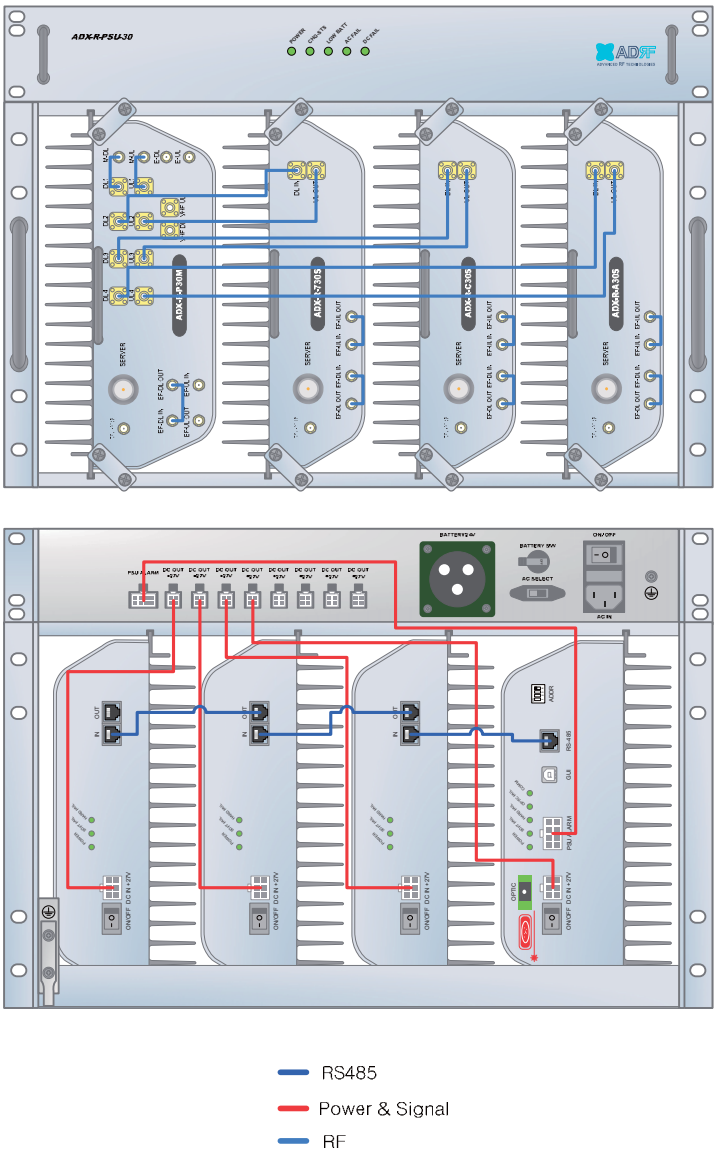



**Figure 4-3 RU Cable connection (4 Sub RU + RU PSU)**

## 4.3 Remote Unit w/ 4-Way Combiner (ADX-R-4WS)

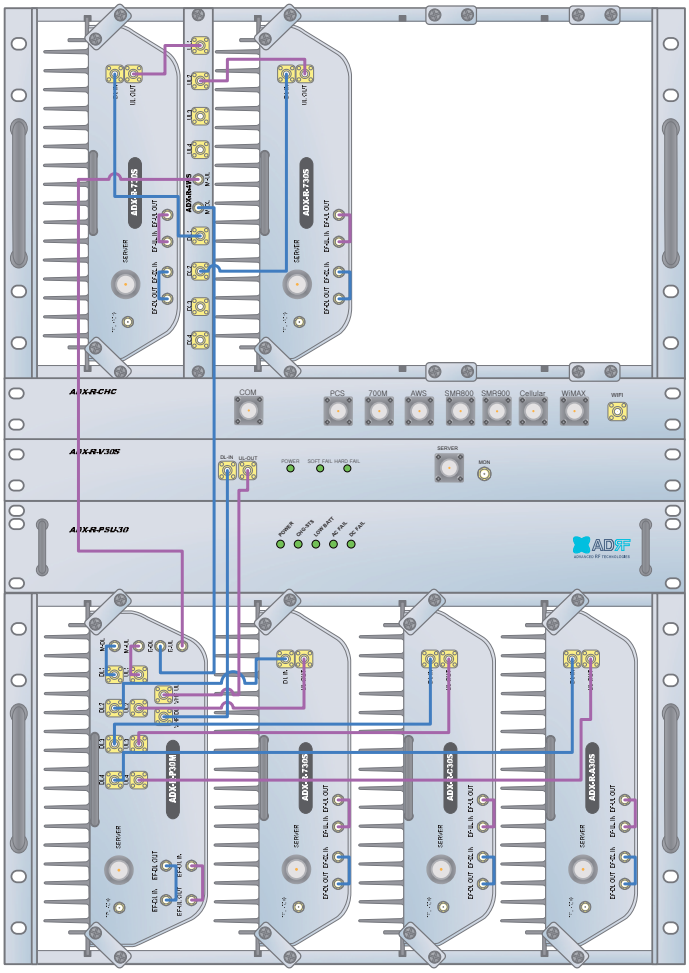



**Figure 4-4 Slave RU Expansion using ADX-R-4WS**

## 5. MOUNTIN G METHOD

### 5.1 H ead End

#### 5.1.1 R ack Mount

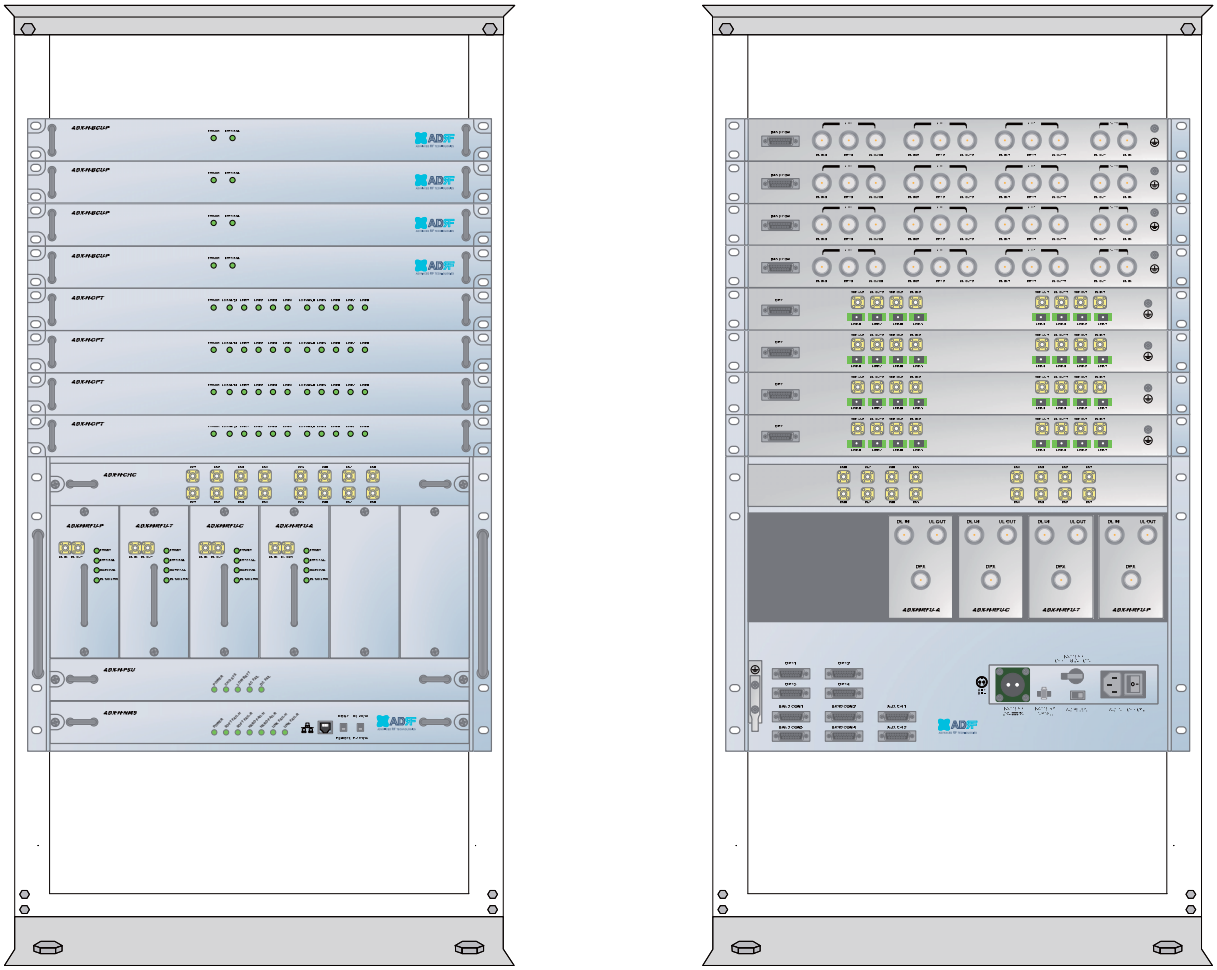


**Figure 5-1 HE Rack Mount (Front & Rear view)**

- Expandable up to 4 OPTs, 4 BCUs and 2 AUX CHs

### 5.1.2 W all Mount

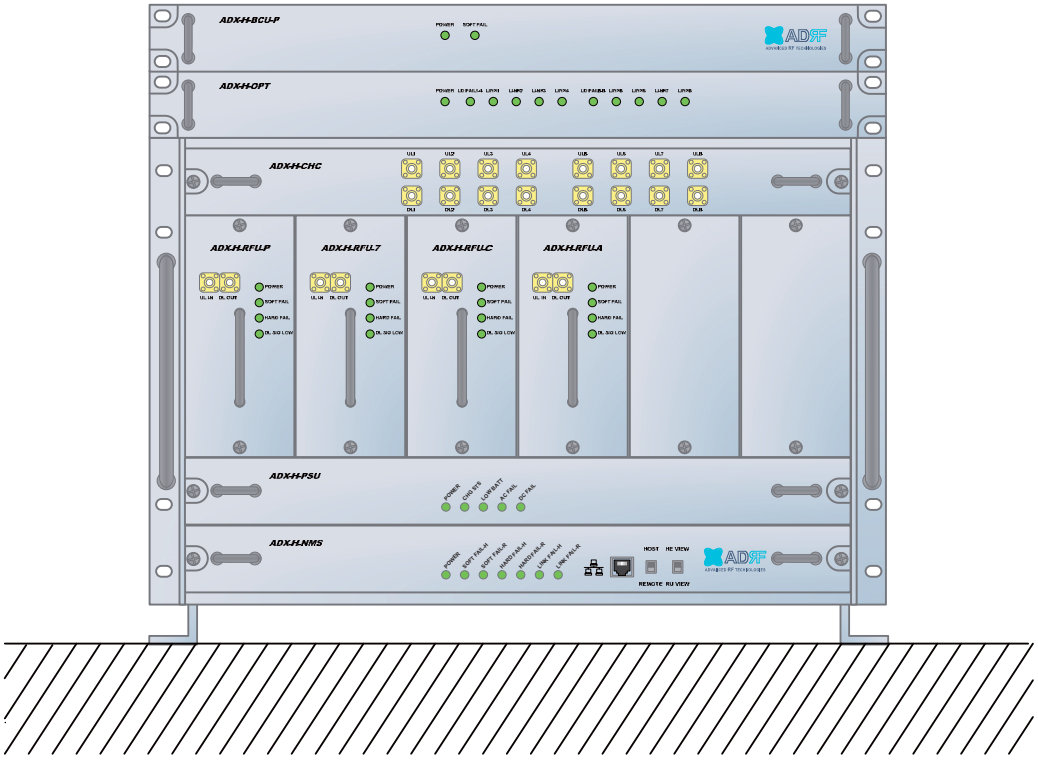



**Figure 5-2 HE Wall Mount (Top View)**

- Expandable up to 3 units (OPT, BCU) or max 3U (132mm)
  - OPT or BCU will be stacked up above basic 19” HE chassis which includes NMS, RFU, PSU and CHC

## 5.2 Remote Unit

### 5.2.1 Rack Mount

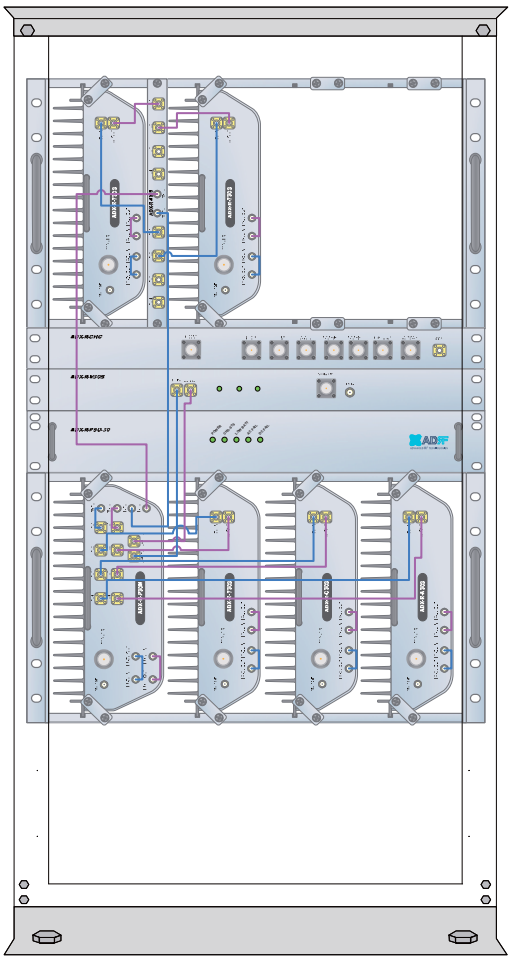
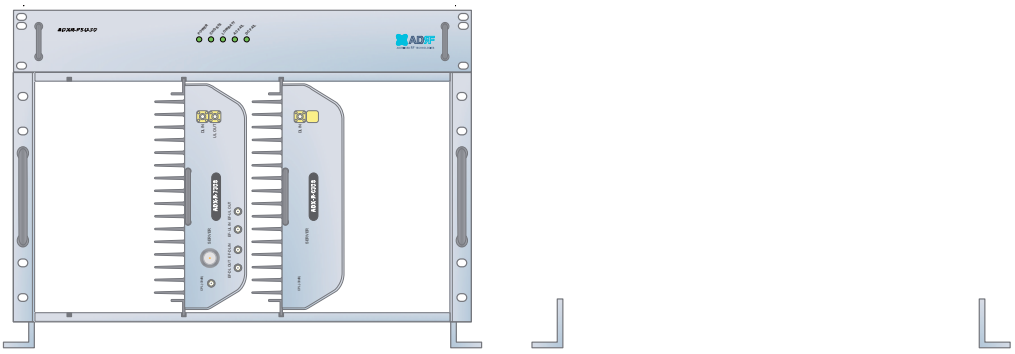


**Figure 5-3 RU Rack Mount (Front view)**

### 5.2.2 W all Mount

#### 5.2.2.1 Remote Unit using RU Chassis (ADX-R-CHA-30)

Wall mount brackets attached to the individual Sub-RU's must be removed before installing Sub-RU's to the RU Chassis.



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IC Warning
This device complies with Industry Canada licence-exempt RSS standard(s).
Operation is subject to the following two conditions: (1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.
L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## 1. SPECIFICATION

<table>
<tr><th colspan="2">Parameters</th><th colspan="2">ADX-R-730S</th><th>ADX-R-C30S</th><th>ADX-R-P30M</th><th>ADX-R-A30S</th></tr>
<tr><td rowspan="6">Frequency</td><td rowspan="3">Downlink</td><td>Lower A</td><td>728-734MHz</td><td rowspan="3">869-894MHz</td><td rowspan="3">1930-1995MHz</td><td rowspan="3">2110-2155MHz</td></tr>
<tr><td>Lower B</td><td>734-740MHz</td></tr>
<tr><td>Upper C</td><td>746-757MHz</td></tr>
<tr><td rowspan="3">Uplink</td><td>Lower A</td><td>698-704MHz</td><td rowspan="3">824-849MHz</td><td rowspan="3">1850-1915MHz</td><td rowspan="3">1710-1755MHz</td></tr>
<tr><td>Lower B</td><td>704-710MHz</td></tr>
<tr><td>Upper C</td><td>776-787MHz</td></tr>
<tr><td colspan="2">Input Power Range</td><td colspan="5">0~+25dBm</td></tr>
<tr><td rowspan="2">Gain</td><td>Downlink</td><td colspan="5">5~30dB</td></tr>
<tr><td>Uplink</td><td colspan="5">-15~20dB</td></tr>
<tr><td colspan="2">Maximum Output Power</td><td colspan="5">30dBm(composite)</td></tr>
<tr><td colspan="2">Noise Figure</td><td colspan="5">< 20dB@maximum gain</td></tr>
<tr><td colspan="2">VSWR</td><td colspan="5">< 1:1.5</td></tr>
<tr><td colspan="2">EVM</td><td colspan="5">< 12.5%</td></tr>
<tr><td colspan="2">Optical Loss</td><td colspan="5">0~5dBo</td></tr>
<tr><td colspan="2">System Delay</td><td colspan="5">< 2us</td></tr>
<tr><td colspan="2">Spurious</td><td colspan="5">Meet FCC rules,  3GPP TS 36.104, 3GPP2 C.S0010-C</td></tr>
<tr><td rowspan="4">Dimension (WXDXH)</td><td>Head-End Shelf</td><td colspan="5">19.0 x 14.6 x 12.2 inches (482 x 370 x 311 mm)</td></tr>
<tr><td>Remote-Unit Shelf</td><td colspan="5">19.0 x 12.9 x 10.5 inches (482 x 328.2 x 266.5 mm)</td></tr>
<tr><td>Master RU</td><td colspan="5">11.8 x 9.8 x 4.5 inches (300 x 249.6 x 114.5 mm)</td></tr>
<tr><td>Slave RU</td><td colspan="5">11.8 x 9.8 x 3.7 inches (300 x 249.6 x 94.5 mm)</td></tr>
<tr><td rowspan="4">Weight</td><td>Head-End Shelf</td><td colspan="5">83.7 lbs (38.0 Kg) @4 RFU, CHC-H, PSU and NMS</td></tr>
<tr><td>Remote-Unit Shelf</td><td colspan="5">61.0 lbs (27.7 kg) @ 1 master RU, 3 Slave RU</td></tr>
<tr><td>Master RU</td><td colspan="5">13.2 lbs (6.0 kg)</td></tr>
<tr><td>Slave RU</td><td colspan="5">11.7 lbs (5.3 kg)</td></tr>
<tr><td colspan="2">Operating Temperature</td><td colspan="5">14-122  F(-10-50°C)</td></tr>
<tr><td colspan="2">Operating Humidity</td><td colspan="5">5~90%RH</td></tr>
<tr><td colspan="2">Power Input</td><td colspan="5">110/220V, 50-60Hz or -48V DC(optional)</td></tr>
<tr><td rowspan="4">Power consumption</td><td rowspan="2">Head-End</td><td colspan="5">55W@4 RFU, 1 OPT and NMS</td></tr>
<tr><td colspan="5">28W@1 RFU, 1 OPT and NMS</td></tr>
<tr><td rowspan="2">Remote-Unit</td><td colspan="5">230W@ 1 Master RU, 3 Slave RU</td></tr>
<tr><td colspan="5">70W@ 1 Master RU or 1 Slave RU</td></tr>
<tr><td colspan="2">Network Management System</td><td colspan="5">Ethernet(RJ45)</td></tr>
<tr><td rowspan="2">RF connector</td><td>Head-End</td><td colspan="5">N-type(Female)</td></tr>
<tr><td>Remote-Unit</td><td colspan="5">N-type(Female)</td></tr>
</table>